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(54)【発明の名称】　研磨体

(57)【要約】

【課題】　研磨体における研磨特性を改善して多くの異種材料からなる半導体基板表面を均一にかつ平滑に研磨できるようにする。

【解決手段】　研磨剤微粉末とバインダーからなる研磨層を可撓性支持体上に設けるについて、研磨剤微粒子がモース硬度６～７で平均粒子サイズが４０～１０００ｎｍの粉体を６０％以上含み、バインダーは金属イオンを捕捉する官能基をもつバインダーを含んでなる。

【特許請求の範囲】

【請求項１】　研磨剤微粉末とバインダーからなる研磨層を可撓性支持体上に設けてなる研磨体において、
前記研磨剤微粒子がモース硬度６～７で平均粒子サイズが４０～１０００ｎｍの粉体を６０％以上含み、前記バインダーは金属イオンを捕捉する官能基をもつバインダーを含むことを特徴とする半導体研磨用の研磨体。

【請求項２】　前記研磨剤が、シリカ、ジルコニア、酸化チタン、酸化セリウム、ベンガラ、ガーネットの内の少なくとも一種を含むことを特徴とする請求項１に記載の研磨体。

【請求項３】　前記研磨層表面の中心線平均表面粗さRaが１～５０００ｎｍであること特徴とする請求項２に記載の研磨体。

【請求項４】　金属を研磨したときの研磨体からの金属イオン汚染量が、Ｎａ，Ｋ，Ｃｒが１５０ｐｐｂ以下であることを特徴とする請求項２に記載の研磨体。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、研磨剤をバインダーに分散してなる研磨層を可撓性支持体上に設けてなり、半導体金属特にアルミニウム、シリコン、銅、フォトレジスト材等で形成される半導体研磨用の研磨体に関するものである。

【０００２】

【従来の技術】従来より、半導体の研磨は、研磨パッドと研磨剤含有の研磨スラリーを用いて研磨しているが、多くの異種材料を研磨するために、歩留まりなどにおいて必ずしも十分な結果が得られていない。つまり、研磨スラリーを使用するものでは研磨に寄与しない研磨剤が多くて研磨効率が低く、その効率化が要望されている。

【０００３】また、被研磨体としての半導体シリコンウェハーは、ガラスを用いているために、従来の磁気ヘッド研磨用の研磨体等で使用しているモース硬度が７を越える硬い研磨剤のみによるものでは、その粒子径を調整しても研磨面に傷が発生して良好な研磨を行うことができない。

【０００４】また、特開平９－２４８７７１号公報等には、ガラスとセラミックとからなる硬度が異なる素材で構成された光コネクタフェルールの表面研磨用として、その硬度差に起因して研磨面に段差が生じるのを防止する研磨体の技術が開示されている。この研磨体は、研磨剤として平均粒子径が５～３０ｍμのシリカ粒子を使用し、研磨層表面の中心線平均表面粗さRaが0.005～0.2μｍとなるようにしたものである。

【０００５】一方、磁気ヘッド又はハードディスク研磨用の研磨体として、特開平１－２６４７７６号公報に示されるものでは、その研磨剤としてモース硬度が５～７の第１の研磨剤と、モース硬度が８．５以上の第２の研磨剤とを混合使用し、その平均粒子径を0.07～0.40μｍとしたものが開示されている。

【０００６】

【発明が解決しようとする課題】しかして、上記のような光コネクタフェルール又は磁気ヘッド研磨用の研磨体では、半導体の異種材料表面を段差を生じることなく平滑に研磨することは困難である。

【０００７】つまり、半導体基板には、アルミニウム、シリコン、フォトレジスト樹脂、タングステン、銅、金などの多くの異種材料が含まれ、多層基板を作製するためには、これらを均一に研磨して平滑面を得る必要がある。

【０００８】そこで、本発明は上記点に鑑みなされたものであって、可撓性支持体上に研磨剤微粉末とバインダーからなる研磨層を設けてなる研磨テープ、研磨シート等の研磨体における研磨特性を改善して多くの異種材料からなる半導体基板表面を均一にかつ平滑に研磨できるようにした研磨体を提供せんとするものである。

【０００９】

【課題を解決するための手段】上記課題を解決した本発明の研磨体は、研磨剤微粉末とバインダーからなる研磨層を可撓性支持体上に設けてなり、前記研磨剤微粒子がモース硬度６～７で平均粒子サイズが４０～１０００ｎｍの粉体を６０％以上含み、前記バインダーは金属イオンを捕捉する官能基をもつバインダーを含むことを特徴とするものである。

【００１０】なお、前記研磨剤微粉末は、シリカ（モース硬度７）、ジルコニア（モース硬度７）、酸化チタン（モース硬度６～７）、酸化セリウム（モース硬度７）、ベンガラ（モース硬度６）、ガーネット（モース硬度７）の内の少なくとも一種を含むものが好適である。また、前記研磨層表面の中心線平均表面粗さRaを１～５０００ｎｍとするのが望ましい。

【００１１】一方、金属を研磨したときの研磨体からの金属イオン汚染量が、Ｎａ，Ｋ，Ｃｒが１５０ｐｐｂ以下となるように設けるのが好ましい。

【００１２】なお、前記バインダーにおける金属イオンを捕捉する官能基としては、酸性官能基、又は、キレート効果のある官能基が好適である。

【００１３】

【発明の効果】上記のような本発明によれば、研磨層における研磨剤微粒子がモース硬度６～７で平均粒子サイズが４０～１０００ｎｍの粉体を６０％以上含むことにより、多くの異種材料からなる半導体基板表面を研磨後における中心線平均表面粗さRaが５ｎｍ以下となるような段差の小さい超平滑面とすることができる。

【００１４】その際、モース硬度６～７のシリカ、ジルコニア、酸化チタン、酸化セリウム、ベンガラ、ガーネットの少なくとも一種を含む研磨剤を６０％以上含むことで、その硬度が半導体に近似し、適度な研磨時間で研磨制御が容易に行える。

【００１５】特に、研磨層の表面の中心線平均表面粗さRaを１～５０００ｎｍとすると、被研磨体のさらなる超平滑面が得られる。

【００１６】また、研磨層のバインダーに金属イオンを捕捉する官能基をもつバインダーを含むことにより、研磨体の不純物イオンをコントロール若しくは研磨層中に保持ないしは低減することで、金属を研磨したときの研磨体からの金属イオン汚染量が、Ｎａ，Ｋ，Ｃｒで１５０ｐｐｂ以下とすることができる。これにより、半導体に注入されるイオンがキャリアー電子の寿命を減少させることが防止できる。

【００１７】さらに研磨体による被研磨体の研磨であることで、研磨スラリーを使用するものに比べて歩留まりが高く効率のよい研磨が行える。

【００１８】

【発明の実施の形態】以下に、本発明の研磨体の実施の形態を示し、本発明をさらに詳細に説明する。

【００１９】本発明の研磨体は、ポリエステルフィルム等による可撓性支持体上に、モース硬度６～７のシリカ、ジルコニア、酸化チタン、酸化セリウム、ベンガラ、ガーネットの少なくとも一種による平均粒子サイズが４０～１０００ｎｍの研磨剤を６０％以上含む研磨剤を、バインダーに分散した研磨層を設けてなり、上記バインダーは金属イオンを捕捉する官能基をもつバインダーを含むものである。また、前記研磨層表面の中心線平均表面粗さRaは、１～５０００ｎｍである。

【００２０】一方、金属を研磨したときの研磨体からの金属イオン汚染量が、Ｎａ，Ｋ，Ｃｒが１５０ｐｐｂ以下となるように設けるものであり、前記バインダーにおける金属イオンを捕捉する官能基としては、酸性官能基、又は、キレート効果のある官能基であり、これらの官能基を有する化合物をバインダーとして使用する。

【００２１】また、被研磨体（半導体基板）の研磨においては、研磨体若しくは被研磨体の少なくとの一方を回転させた状態で行い、回転速度は１０ｒｐｍ以上で、研磨体の送り速度は１０㎜／min 以上で行う。この研磨体の移動により研磨かすを除去する効果も有する。

【００２２】本発明の研磨層で用いられる研磨剤微粉末は、粉体総量の６０％以上がモース硬度６～７でかつ平均粒子サイズが４０～１０００ｎｍの研磨剤を含む。このモース硬度６～７の研磨剤としては、シリカ（モース硬度７）、ジルコニア（モース硬度７）、酸化チタン（モース硬度６～７）、酸化セリウム（モース硬度７）、ベンガラ（モース硬度６）、ガーネット（モース硬度７）の内の少なくとも一種である。

【００２３】研磨層に配合する上記以外の粉体（研磨剤）は、一般的に研磨作用若しくは琢磨作用をもつ材料で、α－アルミナ、γ－アルミナ、α，γ－アルミナ、熔融アルミナ、炭化珪素、酸化クロム、コランダム、人造ダイヤモンド、ダイヤモンド、α－酸化鉄、窒化珪素、窒化硼素、炭化モリブデン、炭化硼素、炭化タングステン、チタンカーバイド等で、主としてモース硬度７以上の材料が１内至４種迄の組み合わせで使用できる。これらの研磨剤は平均粒子サイズが４０～１０００ｎｍの大きさのものが使用される。これらの研磨剤は、研磨層の場合研磨剤１００重量部に対してバインダー１０～１０００重量部の範囲で用いられる。

【００２４】研磨剤の具体例としては、住友化学社製のＡＫＰ１、ＡＫＰ１５、ＡＫＰ２０、ＡＫＰ３０、ＡＫＰ５０、ＡＫＰ８０、Ｈｉｔ５０、Ｈｉｔ１００などが挙げられる。これらについては特公昭５２－２８６４２号、特公昭４９－３９４０２号、特開昭６３－９８８２８号、米国特許３６８７７２５号、米国特許３００７８０７号、米国特許３０４１１９６号、米国特許３２９３０６６号、米国特許３６３０９１０号、米国特許３８３３４１２号、米国特許４１１７１９０号、英国特許１１４５３４９号、西独特許８５３２１１号等に記載されている。

【００２５】本発明の研磨層に使用されるバインダーとしては、従来公知の熱可塑性樹脂、熱硬化性樹脂、反応型樹脂、電子線硬化型樹脂、紫外線硬化型樹脂、可視光線硬化型樹脂やこれらの混合物が使用される。

【００２６】熱可塑性樹脂としては、軟化温度が２００℃以下、平均分子量が１００００～３０００００、重合度が約５０～２０００程度のものでより好ましくは２００～８００程度である。例えば塩化ビニル酢酸ビニル共重合体、塩化ビニル共重合体、塩化ビニル酢酸ビニルビニルアルコール共重合体、塩化ビニルビニルアルコール共重合体、塩化ビニル塩化ビニリデン共重合体、塩化ビニルアクリロニトリル共重合体、アクリル酸エステルアクリロニトリル共重合体、アクリル酸エステル塩化ビニリデン共重合体、アクリル酸エステルスチレン共重合体、メタクリル酸エステルアクリロニトリル共重合体、メタクリル酸エステル塩化ビニリデン共重合体、メタクリル酸エステルスチレン共重合体、ウレタンエラストマー、ナイロン－シリコン系樹脂、ニトロセルロース－ポリアミド樹脂、ポリフッカビニル、塩化ビニリデンアクリロニトリル共重合体、ブタジエンアクリロニトリル共重合体、ポリアミド樹脂、ポリビニルブチラール、セルロース誘導体（セルロースアセテートブチレート、セルロースダイアセテート、セルローストリアセテート、セルロースプロピオネート、ニトロセルロース、エチルセルロース、メチルセルロース、プロピルセルロース、メチルエチルセルロース、カルボキシメチルセルロース、アセチルセルロース等）、スチレンブタジエン共重合体、ポリエステル樹脂、ポリカーボネート樹脂、クロロビニルエーテルアクリル酸エステル共重合体、アミノ樹脂、ポリアミド樹脂など各種の合成ゴム系の熱可塑性樹脂およびこれらの混合物等が使用される。

【００２７】これらの樹脂の例示は、特公昭３７－６８

７７号、特公昭３９－１２５２８号、特公昭３９－１９２８２号、特公昭４０－５３４９号、特公昭４０－２０９０７号、特公昭４１－９４６３号、特公昭４１－１４０５９号、特公昭４１－１６９８５号、特公昭４２－６４２８号、特公昭４２－１１６２１号、特公昭４３－４６２３号、特公昭４３－１５２０６号、特公昭４４－２８８９号、特公昭４４－１７９４７号、特公昭４４－１８２３２号、特公昭４５－１４０２０号、特公昭４５－１４５００号、特公昭４７－１８５７３号、特公昭４７－２２０６３号、特公昭４７－２２０６４号、特公昭４７－２２０６８号、特公昭４７－２２０６９号、特公昭４７－２２０７０号、特公昭４７－２７８８６号、特開昭５７－１３３５２１、特開昭５８－１３７１３３、特開昭５８－１６６５３３、特開昭５８－２２２４３３、特開昭５９－５８６４２等、米国特許４５７１３６４号、米国特許４７５２５３０号の公報等に記載されている。

【００２８】熱硬化性樹脂または反応型樹脂としては、塗布液の状態では２０００００以下の分子量であり、塗布、乾燥後に加熱加湿することにより、縮合、付加等の反応により分子量が無限大となるものが好適である。また、これらの樹脂のなかで、樹脂が熱分解するまでの間に軟化または溶融しないものが好ましい。具体的には例えばフェノール樹脂、フェノキシ樹脂、エポキシ樹脂、ポリウレタン樹脂、ポリエステル樹脂、ポリウレタンポリカーボネート樹脂、尿素樹脂、メラミン樹脂、アルキッド樹脂、シリコン樹脂、アクリル系反応樹脂（電子線硬化樹脂）、エポキシ－ポリアミド樹脂、ニトロセルロースメラミン樹脂、高分子量ポリエステル樹脂とイソシアネートプレポリマーの混合物、メタクリル酸塩共重合体とジイソシアネートプレポリマーの混合物、ポリエステルポリオールとポリイソシアネートとの混合物、尿素ホルムアルデヒド樹脂、低分子量グリコール／高分子量ジオール／トリフェニルメタントリイソシアネートの混合物、ポリアミン樹脂、ポリイミン樹脂およびこれらの混合物等である。

【００２９】これらの樹脂の例示は特公昭３９－８１０３号、特公昭４０－９７７９号、特公昭４１－７１９２号、特公昭４１－８０１６号、特公昭４１－１４２７５号、特公昭４２－１８１７９号、特公昭４３－１２０８１号、特公昭４４－２８０２３号、特公昭４５－１４５０１号、特公昭４５－２４９０２号、特公昭４６－１３１０３号、特公昭４７－２２０６５号、特公昭４７－２２０６６号、特公昭４７－２２０６７号、特公昭４７－２２０７２号、特公昭４７－２２０７３号、特公昭４７－２８０４５号、特公昭４７－２８０４８号、特公昭４７－２８９２２号等の公報に記載されている。

【００３０】これらの熱可塑性樹脂、熱硬化性樹脂、反応型樹脂は、主たる官能基以外に官能基としてカルボン酸（ＣＯＯＭ）、スルフィン酸、スルフェン酸、スルホン酸（SO_3M）、燐酸（ＰＯ(ＯＭ)(ＯＭ)）、ホスホン酸、硫酸（OSO_3M）、及びこれらのエステル基等の酸性基（ＭはＨ、アルカリ金属、アルカリ土類金属、炭化水素基）、アミノ酸類；アミノスルホン酸類、アミノアルコールの硫酸または燐酸エステル類、アルキルベタイン型等の両性類基、アミノ基、イミノ基、イミド基、アミド基等、また、水酸基、アルコキシル基、チオール基、アルキルチオ基、ハロゲン基（Ｆ、Ｃｌ、Ｂｒ、Ｉ）、シリル基、シロキサン基、エポキシ基、イソシアナト基、シアノ基、ニトリル基、オキソ基、アクリル基、フォスフィン基を通常１種以上６種以内含み、各々の官能基は樹脂１ｇあたり1×10^{-6} ｅｑ～1×10^{-2} ｅｑ含むことが好ましい。

【００３１】そして、本発明の研磨層のバインダーには上記バインダーが使用できるが、更に、金属イオンを捕捉する官能基をもつバインダーを含むものである。この金属イオンを捕捉する官能基としては、例えば、酸性官能基、又は、キレート効果のある官能基である。この官能基により、研磨体の不純物イオンをコントロール若しくは研磨層中に保持ないしは低減することで、金属を研磨したときの研磨体からの金属イオン汚染量が、Ｎａ，Ｋ，Ｃｒで１５０ｐｐｂ以下となるように上記金属イオンを捕捉する官能基量を設定する。この金属イオンを捕捉する官能基をもつバインダーの例としては、特公平５－９８４３号に記載されている、塩化ビニル／酢酸ビニル／２－アクリルアミド－２－メチルプロパンスルホン酸；共重合比90.0：7.5：2.5、SO_3H100重量％のものなどが挙げられる。

【００３２】なお、上記金属イオンを捕捉する官能基をもつバインダーは塩になっていないフリーの極性基（例えば－SO_3H）が好ましいが、塩になっている極性基（例えば－SO_3Na）を部分的に有していても金属イオンを捕捉する能力があれば使用することができる。具体的には、フリーの極性基は全極性基の１０重量％以上含まれていることが好ましく、３０重量％以上含まれていることが更に好ましい。

【００３３】本発明の研磨層に用いるポリイソシアネートとしては、トリレンジイソシアネート、４・４’－ジフェニルメタンジイソシアネート、ヘキサメチレンジイソシアネート、キシリレンジイソシアネート、ナフチレン－１・５－ジイソシアネート、ｏ－トルイジンジイソシアネート、イソホロンジイソシアネート、トリフェニルメタントリイソシアネート、イソホロンジイソシアネート等のイソシアネート類、当該イソシアネート類とポリアルコールとの生成物、イソシアネート類の縮合によって生成した２～１０量体のポリイソシアネート、ポリイソシアネートとポリウレタンとの生成物で末端官能基がイソシアネートであるもの等を使用することができる。これらポリイソシアネート類の平均分子量は１００～２００００のものが好適である。

【００３４】これらポリイソシアネートの市販されている商品名としては、コロネートＬ、コロネートＨＬ、コロネート２０３０、コロネート２０３１、ミリオネートＭＲ、ミリオネートＭＴＬ（以上日本ポリウレタン社製）、タケネートＤ－１０２、タケネートＤ－１１０Ｎ、タケネートＤ－２００、タケネートＤ－２０２、タケネート３００Ｓ、タケネート５００（以上武田薬品社製）、スミジュールＴ－８０、スミジュール４４Ｓ、スミジュールＰＦ、スミジュールＬ、スミジュールＮ、デスモジュールＬ、デスモジュールＩＬ、デスモジュールＮ、デスモジュールＨＬ、デスモジュールＴ６５、デスモジュール１５、デスモジュールＲ、デスモジュールＲＦ、デスモジュールＳＬ、デスモジュールＺ４２７３（以上住友バイエル社製）等があり、これらを単独若しくは硬化反応性の差を利用して二つ若しくはそれ以上の組み合わせによって使用することができる。

【００３５】また、硬化反応を促進する目的で、水酸基（ブタンジオール、ヘキサンジオール、分子量が１０００～１００００のポリウレタン、水等）、アミノ基（モノメチルアミン、ジメチルアミン、トリメチルアミン等）を有する化合物や金属酸化物の触媒や鉄アセチルアセトネート等の触媒を併用することもできる。これらの水酸基やアミノ基を有する化合物は多官能であることが望ましい。これらポリイソシアネートは研磨層、バック層ともバインダー樹脂とポリイソシアネートの総量１００重量部あたり２～７０重量部で使用することが好ましく、より好ましくは５～５０重量部である。これらの例示は特開昭６０－１３１６２２号、特開昭６１－７４１３８号等の公報において示されている。

【００３６】その他、研磨層中には各種の機能を持った化合物が添加剤として添加される。例えば、分散剤、潤滑剤、帯電防止剤、酸化防止剤、防黴剤、着色剤、溶剤等が加えられる。

【００３７】本発明の研磨層に使用される粉末状潤滑剤としては、グラファイト、二硫化モリブデン、窒化硼素、弗化黒鉛、炭酸カルシウム、硫酸バリウム、酸化珪素、酸化チタン、酸化亜鉛、酸化錫、二硫化タングステン等の無機微粉末、アクリルスチレン系樹脂微粉末、ベンゾグアナミン系樹脂微粉末、メラミン系樹脂微粉末、ポリオレフイン系樹脂微粉末、ポリエステル系樹脂微粉末、ポリアミド系樹脂微粉末、ポリイミド系樹脂微粉末、ポリフッカエチレン系樹脂微粉末等の樹脂微粉末等がある。

【００３８】また有機化合物系潤滑剤としては、シリコンオイル（ジアルキルポリシロキサン、ジアルコキシポリシロキサン、フェニルポリシロキサン、フルオロアルキルポリシロキサン（信越化学社製ＫＦ９６、ＫＦ６９等））、脂肪酸変性シリコンオイル、フッ素アルコール、ポリオレフィン（ポリエチレンワックス、ポリプロピレン等）、ポリグリコール（エチレングリコール、ポリエチレンオキシドワックス等）、テトラフルオロエチレンオキシドワックス、ポリテトラフルオログリコール、パーフルオロアルキルエーテル、パーフルオロ脂肪酸、パーフルオロ脂肪酸エステル、パーフルオロアルキル硫酸エステル、パーフルオロアルキルスルホン酸エステル、パーフルオロアルキルベンゼンスルホン酸エステル、パーフルオロアルキル燐酸エステル等の弗素や珪素を導入した化合物、アルキル硫酸エステル、アルキルスルホン酸エステル、アルキルホスホン酸トリエステル、アルキルホスホン酸モノエステル、アルキルホスホン酸ジエステル、アルキル燐酸エステル、琥珀酸エステル等の有機酸および有機酸エステル化合物、トリアザインドリジン、テトラアザインデン、ベンゾトリアゾール、ベンゾトリアジン、ベンゾジアゾール、ＥＤＴＡ等の窒素・硫黄を含む複素（ヘテロ）環化合物、炭素数１０～４０の一塩基性脂肪酸と炭素数２～４０個の一価のアルコールもしくは二価のアルコール、三価のアルコール、四価のアルコール、六価のアルコールのいずれか１つもしくは２つ以上とからなる脂肪酸エステル類、炭素数１０個以上の一塩基性脂肪酸と該脂肪酸の炭素数と合計して炭素数が１１～７０個となる一価～六価のアルコールからなる脂肪酸エステル類、炭素数８～４０の脂肪酸或いは脂肪酸アミド類、脂肪酸アルキルアミド類、脂肪族アルコール類も使用できる。

【００３９】これら化合物の具体的な例としては、カプリル酸ブチル、カプリル酸オクチル、ラウリン酸エチル、ラウリン酸ブチル、ラウリン酸オクチル、ミリスチン酸エチル、ミリスチン酸ブチル、ミリスチン酸オクチル、ミリスチン酸２エチルヘキシル、パルミチン酸エチル、パルミチン酸ブチル、パルミチン酸オクチル、パルミチン酸２エチルヘキシル、ステアリン酸エチル、ステアリン酸ブチル、ステアリン酸イソブチル、ステアリン酸オクチル、ステアリン酸２エチルヘキシル、ステアリン酸アミル、ステアリン酸イソアミル、ステアリン酸２エチルペンチル、ステアリン酸２ヘキシルデシル、ステアリン酸イソトリデシル、ステアリン酸アミド、ステアリン酸アルキルアミド、ステアリン酸ブトキシエチル、アンヒドロソルビタンモノステアレート、アンヒドロソルビタンジステアレート、アンヒドロソルビタントリステアレート、アンヒドロソルビタンテトラステアレート、オレイルオレート、オレイルアルコール、ラウリルアルコール、モンタンワックス、カルナウバワックス等があり単独若しくは組み合わせ使用できる。

【００４０】また本発明に使用される潤滑剤としては、潤滑油添加剤も単独若しくは組み合わせで使用でき、防錆剤として知られている酸化防止剤（アルキルフェノール、ベンゾトリアジン、テトラアザインデン、スルファミド、グアニジン、核酸、ピリジン、アミン、ヒドロキノン、ＥＤＴＡ等の金属キレート剤）、錆どめ剤（ナフテン酸、アルケニルコハク酸、燐酸、ジラウリルフォス

フェート等）、油性剤（ナタネ油、ラウリルアルコール等）、極圧剤（ジベンジルスルフィド、トリクレジルフォスフェート、トリブチルホスファイト等）、清浄分散剤、粘度指数向上剤、流動点降下剤、泡どめ剤等がある。これらの潤滑剤はバインダー１００重量部に対して０．０１～３０重量部の範囲で添加される。これらについては、特公昭４３－２３８８９号、特公昭４８－２４０４１号、特公昭４８－１８４８２号、特公昭４４－１８２２１、特公昭４７－２８０４３号、特公昭５７－５６１３２、特開昭５９－８１３６号、特開昭５９－８１３９号、特開昭６１－８５６２１号、米国特許３４２３２３３号、米国特許３４７００２１号、米国特許３４９２２３５号、米国特許３４９７４１１号、米国特許３５２３０８６号、米国特許３６２５７６０号、米国特許３６３０７７２号、米国特許３６３４２５３号、米国特許３６４２５３９号、米国特許３６８７７２５号、米国特許４１３５０３１号、米国特許４４９７８６４号、米国特許４５５２７９４号、アイビーエムテクニカル　ディスクロジャーブリテン（ＩＢＭ Ｔｅｃｈｎｉｃａｌ Ｄｉｓｃｌｏｓｕｒｅ Ｂｕｌｌｅｔｉｎ）Ｖｏｌ．９，Ｎｏ７，ｐ７７９（１９６６年１２月）、エレクトロニク（ＥＬＥＫＴＲＯＮＩＫ）１９６１年Ｎｏ１２，ｐ３８０、化学便覧，応用編，ｐ９５４－９６７，１９８０年丸善株発行等に記載されている。

【００４１】本発明に使用する分散剤、分散助剤としては、カプリル酸、カプリン酸、ラウリン酸、ミリスチン酸、パルミチン酸、ステアリン酸、オレイン酸、エライジン酸、リノール酸、リノレン酸、ステアロール酸、ベヘン酸、マレイン酸、フタル酸等の炭素数２～４０個の脂肪酸（R_1ＣＯＯＨ、R_1は炭素数１～３９個のアルキル基、フェニル基、アラルキル基）、前記の脂肪酸のアルカリ金属（Ｌｉ、Ｎａ、Ｋ、ＮＨ$_4^+$等）またはアルカリ土類金属（Ｍｇ、Ｃａ、Ｂａ等）、Ｃｕ、Ｐｂ等からなる金属石鹸（オレイン酸銅）、脂肪酸アミド；レシチン（大豆油レシチン）等が使用される。この他に炭素数４～４０の高級アルコール（ブタノール、オクチルアルコール、ミリスチルアルコール、ステアリルアルコール）及びこれらの硫酸エステル、スルホン酸、フェニルスルホン酸、アルキルスルホン酸、スルホン酸エステル、燐酸モノエステル、燐酸ジエステル、燐酸トリエステル、アルキルホスホン酸、フェニルホスホン酸、アミン化合物等も使用可能である。また、ポリエチレングリコール、ポリエチレンオキサイド、スルホ琥珀酸、スルホ琥珀酸金属塩、スルホ琥珀酸エステル等も使用可能である。これらの分散剤は通常一種類以上で用いられ、一種類の分散剤はバインダー１００重量部に対して０．００５～２０重量部の範囲で添加される。これら分散剤の使用方法は、研磨剤や非研磨微粉末の表面に予め被着させてもよく、また分散途中で添加してもよい。このようなものは、例えば特公昭３９－２８３６９号、特公昭４４－１７９４５号、特公昭４４－１８２２１号、特公昭４８－７４４１号、特公昭４８－１５００１号、特公昭４８－１５００２号、特公昭４８－１６３６３号、特公昭４９－３９４０２号、米国特許３３８７９９３号、同３４７００２１号等において示されている。

【００４２】本発明に用いる防黴剤としては、２－（４－チアゾリル）－ベンズイミダゾール、Ｎ－（フルオロジクロロメチルチオ）－フタルイミド、１０・１０’－オキシビスフェノキサルシン、２・４・５・６テトラクロロイソフタロニトリル、Ｐ－トリルジヨードメチルスルホン、トリヨードアリルアルコール、ジヒドロアセト酸、フェニルオレイン酸水銀、酸化ビス（トリブチル錫）、サルチルアニライド等がある。このようなものは、例えば「微生物災害と防止技術」１９７２年工学図書、「化学と工業」３２，９０４（１９７９）等において示されている。

【００４３】本発明に用いる帯電防止剤としては、カーボンブラックが使用でき、例えば、ゴム用ファーネス、ゴム用サーマル、カラー用ブラック、アセチレンブラック等を用いることができる。その比表面積は５～５００ｍ^2／ｇ、ＤＢＰ吸油量は１０～４００ｍｌ／１００ｇ、ｐＨは２～１０、含水率は０．１～１０％、タップ密度は０．１～１ｇ／ｃｍ^{2}であるのが好ましい。このカーボンブラックの具体的な例としては、キャボット社製：ＢＬＡＣＫＰＥＡＲＬＳ　２０００，１３００，１０００，９００，８００，７００、三菱化成工業社製：６５０Ｂ，９５０Ｂ，３２５０Ｂ，８５０，９００，９６０，９８０，１０００，２３００，２４００，２６００等があげられる。また、カーボンブラックを分散剤等で表面処理したり、樹脂でグラファイト化したものを用いることもできる。

【００４４】本発明に用いるカーボンブラック以外の帯電防止剤としては、グラファイト、変性グラファイト、カーボンブラックグラフトポリマー、酸化錫－酸化アンチモン、酸化錫、酸化チタン－酸化錫－酸化アンチモン等の導電性粉末；サポニン等の天然界面活性剤；アルキレンオキサイド系、グリセリン系、グリシドール系、多価アルコール、多価アルコールエステル、アルキルフェノールＥＯ付加体等のノニオン界面活性剤；高級アルキルアミン類、環状アミン、ヒダントイン誘導体、アミドアミン、エステルアミド、第四級アンモニウム塩類、ピリジンそのほかの複素環類、ホスホニウムまたはスルホニウム類等のカチオン界面活性剤；カルボン酸、スルホン酸、ホスホン酸、燐酸、硫酸エステル基、ホスホン酸エステル、燐酸エステル基などの酸性基を含むアニオン界面活性剤；アミノ酸類；アミノスルホン酸類、アミノアルコールの硫酸または燐酸エステル類、アルキルベタイン型等の両性界面活性剤等が使用される。

【００４５】これら帯電防止剤として使用し得る界面活性剤化合物例の一部は、特開昭６０－２８０２５号、米

国特許２２７１６２３号、同２２４０４７２号、同２２８８２２６号、同２６７６１２２号、同２６７６９２４号、同２６７６９７５号、同２６９１５６６号、同２７２７８６０号、同２７３０４９８号、同２７４２３７９号、同２７３９８９１号、同３０６８１０１号、同３１５８４８４号、同３２０１２５３号、同３２１０１９１号、同３２９４５４０号、同３４１５６４９号、同３４４１４１３号、同３４４２６５４号、同３４７５１７４号、同３５４５９７４号、西独特許公開（ＯＬＳ）１９４２６６５号、英国特許１０７７３１７号、同１１９８４５０号等をはじめ、小田良平他著『界面活性剤の合成とその応用』（槇書店１９７２年版）；Ａ．Ｗ．ベイリ著『サーフエス　アクテイブ　エージエンツ』（インターサイエンス　パブリケーション　コーポレイテッド１９８５年版）；Ｔ．Ｐ．シスリー著『エンサイクロペディア　オブ　サーフエスアクティブ　エージェンツ，第２巻』（ケミカルパブリシュカンパニー１９６４年版）；『界面活性剤便覧』第六刷（産業図書株式会社，昭和４１年１２月２０日）；丸茂秀雄著『帯電防止剤』幸書房（１９６８）等に記載されている。

【００４６】これらの界面活性剤は単独または混合して添加してもよい。研磨体における、これらの界面活性剤の使用量は、研磨剤１００重量部当たり０．０１～１０重量部である。またバック層での使用量はバインダー１００重量部当たり０．０１～３０重量部である。これらは帯電防止剤として用いられるものであるが、時としてそのほかの目的、例えば分散の改良、潤滑性の改良、塗布助剤、湿潤剤、硬化促進剤、分散促進剤として適用される場合もある。

【００４７】本発明の分散、混練、塗布の際に使用する有機溶媒としては、任意の比率でアセトン、メチルエチルケトン、メチルイソブチルケトン、シクロヘキサノン、イソホロン、テトラヒドロフラン等のケトン系；メタノール、エタノール、プロパノール、ブタノール、イソブチルアルコール、イソプロピルアルコール、メチルシクロヘキサノールなどのアルコール系；酢酸メチル、酢酸エチル、酢酸ブチル、酢酸イソブチル、酢酸イソプロピル、乳酸エチル、酢酸グリコールモノエチルエーテル等のエステル系；ジエチルエーテル、テトラヒドロフラン、グリコールジメチルエーテル、グリコールモノエチルエーテル、ジオキサンなどのエーテル系；ベンゼン、トルエン、キシレン、クレゾール、クロルベンゼン、スチレンなどのタール系（芳香族炭化水素）；メチレンクロライド、エチレンクロライド、四塩化炭素、クロロホルム、エチレンクロルヒドリン、ジクロルベンゼン等の塩素化炭化水素、Ｎ・Ｎ－ジメチルホルムアルデヒド、ヘキサン等が使用できる。またこれら溶媒は通常任意の比率で２種以上で用いる。また１重量％以下の量で微量の不純物（その溶媒自身の重合物、水分、原料成分等）を含んでもよい。有機溶媒の代わりに水系溶媒（水、アルコール、アセトン等）を使用することもできる。

【００４８】研磨層の形成は上記の組成などを任意に組合せて有機溶媒に溶解し、塗布溶液として支持体上に塗布・乾燥する。この支持体は可撓性を有し、厚みが５０～３００μｍ程度（ディスクもしくはカード状の場合は厚みが０．０３～１０ｍｍ程度）である。素材としてはポリエチレンテレフタレート、ポリエチレンナフタレート等のポリエステル類、ポリプロピレン等のポリオレフィン類、セルローストリアセテート、セルロースダイアセテート等のセルロース誘導体、ポリ塩化ビニル等のビニル系樹脂類、ポリカーボネート、ポリイミド、ポリアミド、ポリスルホン等のプラスチックのほかにアルミニウム、銅等の金属、ガラス等のセラミックス、紙等も使用できる。これらの支持体は塗布に先立って、コロナ放電処理、プラズマ処理、下塗処理、熱処理、除塵埃処理、金属蒸着処理、アルカリ処理を行ってもよい。これら支持体に関しては、例えば、西独特許３３３８８５４Ａ、特開昭５９－１１６９２６号、特開昭６１－１２９７３１号、米国特許４３８８３６８号；三石幸夫著、『繊維と工業』３１巻，ｐ５０～５５，１９７５年などに記載されている。これら支持体の中心線平均表面粗さRaは０．００１～５．０μｍが好ましい。またこれら支持体のヤング率（Ｆ５値）は目的に応じて、幅方向、長手方向とも２～３０Ｋｇ／ｍｍ^2（１Ｋｇ／ｍ^2＝９．８Ｐａ）を選択することができる。

【００４９】分散、混練の方法には特に制限はなく、また各成分の添加順序（樹脂、粉体、潤滑剤、溶媒等）、分散・混練中の添加位置、分散温度（０～８０℃）などは適宜設定することができる。研磨塗料の調製には通常の混練機、例えば、二本ロールミル、三本ロールミル、ボールミル、ペブルミル、トロンミル、サンドグラインダー、ツェグバリ（Ｓｚｅｇｖａｒｉ）アトライター、高速インペラー、分散機、高速ストーンミル、高速度衝撃ミル、ディスパー、ニーダー、高速ミキサー、リボンブレンダー、コニーダー、インテンシブミキサー、タンブラー、ブレンダー、ディスパーザー、ホモジナイザー、単軸スクリュー押し出し機、二軸スクリュー押し出し機、及び超音波分散機などを用いることができる。通常分散・混練にはこれらの分散・混練機を複数備え、連続的に処理を行う。混練分散に関する技術の詳細は、Ｔ．Ｃ．ＰＡＴＴＯＮ著（テー．シー．パットン）“Ｐａｉｎｔ Ｆｌｏｗ ａｎｄ Ｐｉｇｍｅｎｔ Ｄｉｓｐｅｒｓｉｏｎ”（ペイントフロー　アンド　ピグメント　ディスパージョン）１９６４年Ｊｏｈｎ Ｗｉｌｅｙ ＆ Ｓｏｎｓ社発行（ジョン　ウイリー　アンドサンズ））や田中信一著『工業材料』２５巻３７（１９７７）などや当該書籍の引用文献に記載されている。これら分散、混練の補助材料として分散・混練を効率よく進めるため、球相当径で１０ｃｍφ～０．０５ｍｍφの

径のスチールボール、スチールビーズ、セラミックビーズ、ガラスビーズ、有機ポリマービーズを用いることができる。またこれら材料は球形に限らない。また、米国特許第２５８１４１４号及び同第２８５５１５６号などの明細書にも記載がある。本発明においても上記の書籍や当該書籍の引用文献などに記載された方法に準じて混練分散を行い研磨層塗布液を調製することができる。

【００５０】支持体上へ前記の研磨層を塗設する方法としては、加熱溶融状態で支持体と共に同時押し出し（共押し出し）を行うか、下地（支持体）を押し出し成膜した後に、その上側に研磨層を塗設する。上記のようにして支持体上に研磨層を積層した後、加熱延伸するものであり、１２０～１６０℃で配向延伸した後、冷却し巻き取る。この延伸は縦横単独か、縦横両方に行う。

【００５１】研磨体が研磨テープの場合には、作製した研磨テープを裁断したあと所望のプラスチックや金属のリールに巻き取る。巻き取る直前ないしはそれ以前の工程において研磨テープその他の研磨体をバーニッシュおよび／またはクリーニングすることが望ましい。バーニッシュは研磨体の表面粗度と研磨力を制御するために具体的にはサファイア刃、剃刀刃、超硬材料刃、ダイアモンド刃、セラミックス刃のような硬い材料により研磨面の突起部分をそぎおとし均一にもしくは平滑にする。これら材料のモース硬度は８以上が好ましいが特に制限はなく突起を除去できるものであれば良い。これら材料の形状は特に刃である必要はなく、角型、丸型、ホイール（回転する円筒形状の周囲にこれらの材質を付与しても良い）のような形状でも使用できる。また研磨体のクリーニングは、研磨体表面の汚れや余分な潤滑剤を除去する目的で研磨体表層を不織布などでワイピングすることにより行う。このようなワイピングの材料としては、例えば日本バイリーン社製の各種バイリーンや東レ社製のトレシー、エクセーヌ、商品名キムワイプ、富士写真フィルム社製の各種研磨体、また不織布はナイロン製不織布、ポリエステル製不織布、レーヨン製不織布、アクリロニトリル製不織布、混紡不織布など、ティッシュペーパー等が使用できる。これらは例えば特公昭４６－３９３０９号、特公昭５８－４６７６８号、特開昭５６－９０４２９号、特公昭５８－４６７６７号、特開昭６３－２５９８３０号、特開平１－２０１８２４号等にも記載されている。

【００５２】本発明に使用される研磨剤、バインダー、添加剤（潤滑剤、分散剤、帯電防止剤、表面処理剤、カーボンブラック、研磨剤、遮光剤、酸化防止剤、防黴剤等）、溶剤及び支持体（下塗層、バック層、バック下塗層を有してもよい）或いはその製法に関しては、特公昭＊５６－２６８９０号等に記載されている製造方法等を参考にできる。

【００５３】

【実施例】以下に、本発明の実施例および比較例を示し、その特性を評価する。なお、実施例中の「部」は「重量部」を示す。

【００５４】＜実施例１～５＞厚さ１２５μmのポリエチレンテレフタレートによる支持体上に下塗り層を設け、その上に下記組成Ａを均一に混練分散し、粘度調整し、硬化剤を混入した研磨層用塗布液を塗布し乾燥させて研磨層を設け、所定の大きさに切り出して研磨体の試料を作製した。

【００５５】各実施例１～４は、下記表１に示すように、研磨剤がシリカ（平均粒子サイズ：０．１μm）で、バインダーの官能基（スルホン酸基）の量（Y×10^{-4}当量／g）が異なるもので、実施例５は研磨剤が酸化チタン（平均粒子サイズ：０．１μm）で、官能基は実施例１と同様である。なお、上記バインダーの官能基は全量がフリーな官能基（SO_3H）である。

【００５６】上記実施例の研磨体によって、アルミニウムとシリカを同時に研磨して、研磨面の段差を測定すると共に、シリコン表面の研磨を行い研磨後のシリコン表面の金属イオン濃度を測定した結果を下記表１に示す。

【００５７】＜比較例１～４＞表１には、比較例１～４の研磨体による同様の研磨テストを行った結果を併記している。比較例１は、前記実施例１～４に対し金属イオンを捕捉する官能基を含まないバインダーの例であり、比較例２，３はモース硬度が８又は９と高い研磨剤の例であり、比較例４はモース硬度が５と低い研磨剤の例であり、比較例２～４のバインダーは実施例１と同様である。

【００５８】表１の結果から、本発明実施例１～５による研磨体では、異種材料の同時研磨における段差は３～５ｎｍと小さく平滑で良好な研磨が行え、研磨後のシリコン表面の金属イオン濃度も８０～１００ｐｐｂと汚染量が小さな値で良好な結果が得られている。これに対し、比較例１ではバインダーに金属イオンを捕捉する官能基を含まないことで、段差は小さいがシリコン表面の金属イオン汚染量が大きな値となっている。また、研磨剤のモース高度が高い比較例２及び３では、段差が大きな値となって平滑性が得られていない共に、シリコン表面の金属イオン汚染量も大きな値となっている。さらに、研磨剤のモース高度が低い比較例４では、段差は小さな値であるが、シリコン表面の金属イオン汚染量が大きな値となっている。

【００５９】

［研磨層用塗布液組成：Ａ］

研磨剤（材質：Ｘ，平均粒子サイズ０．１μm）	１００部
バインダー（ポリエステルポリウレタン：ネオペンチルグリコール／カプロラクトン／フタル酸／ジフェニルメタン	

ジイソシアネート＝３／2.1／4.7／1.0モル，SO_3H100重量%含有，含有量Y×10^{-4} eq/g)	１０部
バインダー（イソシアネート）	２部
分散剤（スルホ琥珀酸エステル）	0.１部
希釈剤（メチルエチルケトン）	１５０部

【００６０】

＊　＊【表１】

	研　磨　剤		ﾊﾞｲﾝﾀﾞｰ官能基量	段　差	金属ｲｵﾝ濃度
	材質X	モース硬度	Y×10^{-4}eq/g	nm	ppb
実施例１	シリカ	7	１０	5	１００
実施例２	シリカ	7	4	5	１００
実施例３	シリカ	7	1	5	９０
実施例４	シリカ	7	0.１	5	１００
実施例５	酸化チタン	6	0.１	3	８０
比較例１	シリカ	7	なし	5	２５００
比較例２	酸化クロム	8	１０	４５	７００
比較例３	アルミナ	9	１０	５０	１２００
比較例４	γFe_2O_3	5	１０	0	５０００

【００６１】表１における研磨条件は、被研磨物を１００ｒｐｍで回転させ、研磨体送り速度を１００㎜／min とし、研磨時間は３０秒間である。段差測定試験は、アルミニウムとシリカの測定面をまず平坦に研磨した後、この平坦面を横に合わせて同時に上記条件で研磨し、研磨後のアルミニウムとシリカの研磨面段差を測定したものである。また、金属イオン濃度の測定は、シリコン表面を上記条件で研磨を３０秒行い、このシリコン表面の金属イオン濃度を測定したものである。

JAPANESE [JP,11-188647,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS EXAMPLE

[Translation done.]

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CLAIMS

[Claim(s)]
[Claim 1] Average grain size is the polish object for semi-conductor polish to which it is characterized by said binder containing a binder with the functional group which catches a metal ion, including the fine particles said whose abrasive material particle is 40-1000nm in Mohs hardness 6-7 in the polish object which comes to prepare the polish layer which consists of abrasive material impalpable powder and a binder on a flexible base material 60% or more.
[Claim 2] The polish object according to claim 1 with which said abrasive material is characterized by the thing of a silica, a zirconia, titanium oxide, cerium oxide, red ocher, and the garnets included for a kind at least.
[Claim 3] The polish object according to claim 2 by which it is being [center line average surface roughness Ra of said polish layer front face / 1-5000nm] characterized.
[Claim 4] The polish object according to claim 2 with which the amount of metal ion contamination from the polish object when grinding a metal is characterized by Na, K, and Cr being 150 or less ppb.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the polish object for semi-conductor polish which comes to prepare the polish layer which comes to distribute an abrasive material to a binder on a flexible base material, and is formed by a semi-conductor metal especially aluminum, silicon, copper, photoresist material, etc.
[0002]
[Description of the Prior Art] Conventionally, although polish of a semi-conductor is ground using the polish slurry of a scouring pad and abrasive material content, in order to grind many dissimilar materials, in the yield etc., sufficient result is not necessarily obtained. That is, in what uses a polish slurry, there are many abrasive materials which do not contribute to polish, polish effectiveness is low, and the increase in efficiency is demanded.
[0003] Moreover, in what is depended only on the hard abrasive material to which the Mohs hardness currently used with the polish object for the conventional magnetic-head polish etc. exceeds 7, since glass is used for the semi-conductor silicon wafer as the ground body, even if it adjusts the particle diameter, a blemish occurs in a polished surface and it cannot perform good polish.
[0004] Moreover, the technique of the polish object which prevents that originate in the hardness difference and a level difference arises in a polished surface as an object for surface polish of the optical connecter ferrule which consisted of materials for which the degrees of hardness which consist of glass and a ceramic differ is indicated by JP,9-248771,A. The silica particle whose mean particle diameter is 5-30mmicro as an abrasive material is used for this polish object, and it is made for center line average surface roughness Ra of a polish layer front face to be set to 0.005-0.2 micrometers.
[0005] On the other hand, by what is shown in JP,1-264776,A, that to which Mohs hardness carried out mixed use of the 2nd 8.5 or more abrasive materials with the 1st abrasive material of 5-7, and Mohs hardness set the mean particle diameter to 0.07-0.40 micrometers as the abrasive material is indicated as the magnetic head or a polish object for hard disk polish.
[0006]
[Problem(s) to be Solved by the Invention] A deer is carried out and it is difficult with above optical connecter ferrules or polish objects for magnetic-head polish to grind the dissimilar-material front face of a semi-conductor flat and smooth, without producing a level difference.
[0007] That is, many dissimilar materials, such as aluminum, silicon, photoresist resin, a tungsten, copper, and gold, are contained, and in order to produce a multilayer substrate, it is necessary to grind these to homogeneity and to acquire a smooth side to a semi-conductor substrate.
[0008] Then, this invention uses as an offer plug the polish object which enabled it to grind the semi-conductor substrate front face which is made in view of the point describing above, improves the polish property in polish objects which come to prepare the polish layer which consists of abrasive material impalpable powder and a binder on a flexible base material, such as a polish tape and a polish sheet, and consists of many dissimilar materials uniformly and flat and smooth.

[0009]
[Means for Solving the Problem] The polish object of this invention which solved the above-mentioned technical problem comes to prepare the polish layer which consists of abrasive material impalpable powder and a binder on a flexible base material, and said abrasive material particle is characterized by average grain size containing the binder in which said binder has the functional group which catches a metal ion, including the fine particles which are 40-1000nm 60% or more with Mohs hardness 6-7.
[0010] In addition, the thing of a silica (Mohs hardness 7), a zirconia (Mohs hardness 7), titanium oxide (Mohs hardness 6-7), cerium oxide (Mohs hardness 7), red ocher (Mohs hardness 6), and the garnets (Mohs hardness 7) which contains a kind at least is suitable for said abrasive material impalpable powder. Moreover, it is desirable to set center line average surface roughness Ra of said polish layer front face to 1-5000nm.
[0011] It is desirable that the amount of metal ion contamination from the polish object when grinding a metal prepares on the other hand so that Na, K, and Cr may be set to 150 or less ppb.

[0012] In addition, as a functional group which catches the metal ion in said binder, an acid functional group or a functional group with a chelate effect is suitable.
[0013]
[Effect of the Invention] According to above this inventions, the abrasive material particle in a polish layer can consider as the small super-Taira glide plane of a level difference from which center line average surface roughness Ra after grinding the semi-conductor substrate front face which consists of many dissimilar materials by including the fine particles whose average grain size is 40-1000nm 60% or more is set to 5nm or less with Mohs hardness 6-7.
[0014] In that case, the degree of hardness resembles a semi-conductor by the abrasive material of the silica of Mohs hardness 6-7, a zirconia, titanium oxide, cerium oxide, red ocher, and a garnet which contains a kind at least being included 60% or more, and polish control can be easily performed by moderate polish time amount.
[0015] If center line average surface roughness Ra of the front face of a polish layer is especially set to 1-5000nm, the further super-Taira glide plane of the ground body will be obtained.
[0016] Moreover, the amount of metal ion contamination from the polish object when grinding a metal by holding or reducing the impurity ion of a polish object in control or a polish layer is 150 or less ppb by Na, K, and Cr by including the binder which has the functional group which catches a metal ion in the binder of a polish layer. It can prevent that the ion poured into a semi-conductor decreases the life of a carrier electron by this.
[0017] Compared with what uses a polish slurry, efficient polish with the high yield can be performed because it is furthermore polish of the ground body with a polish object.
[0018]
[Embodiment of the Invention] Below the gestalt of operation of the polish object of this invention is shown, and this invention is further explained to it at a detail.
[0019] On the flexible base material according [the polish object of this invention] to polyester film etc., it comes to prepare the polish layer to which the silica of Mohs hardness 6-7, a zirconia, titanium oxide, cerium oxide, red ocher, and an average grain size of a garnet according to a kind at least distributed the abrasive material which contains the abrasive material which is 40-1000nm 60% or more to the binder, and the above-mentioned binder contains a binder with the functional group which catches a metal ion. Moreover, center line average surface roughness Ra of said polish layer front face is 1-5000nm.
[0020] On the other hand, it prepares so that Na, K, and Cr may be set to 150 or less ppb, and as a functional group which catches the metal ion in said binder, the amount of metal ion contamination from the polish object when grinding a metal is an acid functional group or a functional group with a chelate effect, and uses as a binder the compound which has these functional groups.
[0021] Moreover, it carries out, where one side that there is little polish object or ground body is rotated in polish of the ground body (semi-conductor substrate), and rotational speed is ten or more rpm, and the feed rates of a polish object are 10 mm/min. It carries out above. It also has

the effectiveness that migration of this polish object removes polish or **.

[0022] The abrasive material impalpable powder used in the polish layer of this invention contains the abrasive material whose average grain size 60% or more of a fine-particles total amount is Mohs hardness 6-7, and is 40-1000nm. as the abrasive material of this Mohs hardness 6-7 — the inside of a silica (Mohs hardness 7), a zirconia (Mohs hardness 7), titanium oxide (Mohs hardness 6-7), cerium oxide (Mohs hardness 7), red ocher (Mohs hardness 6), and a garnet (Mohs hardness 7) — at least — a kind — it is .

[0023] Fine particles other than the above blended with a polish layer (abrasive material) are the ingredients which generally have scouring or the Takuma operation, they are alpha-alumina, gamma-alumina, alpha, gamma-alumina, a melting alumina, silicon carbide, chrome oxide, corundum, a man made diamond, a diamond, alpha-ferrous oxide, silicon nitride, boron nitride, carbonization molybdenum, boron carbide, tungsten carbide, a titanium carbide, etc., and a with a Mohs hardness of seven or more ingredient can mainly use them in the combination to four sorts of ** in one. As for these abrasive materials, the thing of the magnitude whose average grain size is 40-1000nm is used. In the case of a polish layer, these abrasive materials are used in the range of a binder 10 - the 1000 weight sections to the abrasive material 100 weight section.

[0024] As an example of an abrasive material, AKP1, AKP15, AKP20, AKP30, AKP50, AKP80, Hit50, Hit100, etc. by Sumitomo Chemical Co., Ltd. are mentioned. These are indicated by JP,52-28642,B, JP,49-39402,B, JP,63-98828,A, a U.S. Pat. No. 3687725 number, a U.S. Pat. No. 3007807 number, a U.S. Pat. No. 3041196 number, a U.S. Pat. No. 3293066 number, a U.S. Pat. No. 3630910 number, a U.S. Pat. No. 3833412 number, a U.S. Pat. No. 4117190 number, British JP,1145349,B, West German JP,853211,B, etc.

[0025] As a binder used for the polish layer of this invention, well-known thermoplastics, thermosetting resin, reaction type resin, electron ray hardening mold resin, ultraviolet curing mold resin, visible-ray hardening mold resin, and such mixture are used conventionally.

[0026] As thermoplastics, 200 degrees C or less and average molecular weight are [10000-300000 and polymerization degree] about 50 to about 2000, and softening temperature is 200 to about 800 more preferably. For example, a vinyl chloride vinyl acetate copolymer, a vinyl chloride copolymer, a vinyl chloride vinyl acetate vinyl alcohol copolymer, A vinyl chloride vinyl alcohol copolymer, a vinyl chloride vinylidene chloride copolymer, A vinyl chloride acrylonitrile copolymer, an acrylic ester acrylonitrile copolymer, An acrylic ester vinylidene-chloride copolymer, an acrylic ester styrene copolymer, A methacrylic ester acrylonitrile copolymer, a methacrylic ester vinylidene-chloride copolymer, A methacrylic ester styrene copolymer, urethane elastomer, nylon-silicon system resin, Nitrocellulose-polyamide resin, poly hooker vinyl, a vinylidene-chloride acrylonitrile copolymer, Butadiene Acrylonitrile, polyamide resin, a polyvinyl butyral, a cellulosic (cellulose acetate butylate and cellulose die acetate —) Cellulose triacetate, cellulose propionate, a nitrocellulose, Ethyl cellulose, methyl cellulose, a propyl cellulose, methylethylcellulose, A styrene butadiene copolymer, such as a carboxymethyl cellulose and an acetyl cellulose, Various kinds of thermoplastics of a synthetic-rubber system, such mixture, etc., such as polyester resin, polycarbonate resin, a chloro vinyl ether acrylic ester copolymer, amino resin, and polyamide resin, are used.

[0027] Instantiation of these resin JP,37-6877,B, JP,39-12528,B, JP,39-19282,B, JP,40-5349,B, JP,40-20907,B, JP,41-9463,B, JP,41-14059,B, JP,41-16985,B, JP,42-6428,B, JP,42-11621,B, JP,43-4623,B, JP,43-15206,B, JP,44-2889,B, JP,44-17947,B, JP,44-18232,B, JP,45-14020,B, JP,45-14500,B, JP,47-18573,B, JP,47-22063,B, JP,47-22064,B, JP,47-22068,B, JP,47-22069,B, JP,47-22070,B, JP,47-27886,B, JP,57-133521,A, JP,58-137133,A, JP,58-166533,A, JP,58-222433,A, JP,59-58642,A, etc. are indicated by the official report of a U.S. Pat. No. 4571364 number and a U.S. Pat. No. 4752530 number etc.

[0028] As thermosetting resin or reaction type resin, in the state of coating liquid, it is 200000 or less molecular weight, and that from which molecular weight becomes infinite by reactions, such as condensation and addition, is suitable by carrying out heating humidification after spreading and desiccation. Moreover, what will not be softened or fused in these resin by the time resin pyrolyzes is desirable. Specifically For example, phenol resin, phenoxy resin, an epoxy resin, Polyurethane resin, polyester resin, polyurethane polycarbonate resin, A urea-resin, melamine resin, an alkyd resin, silicon resin, acrylic reaction resin (electron ray hardening resin), The mixture of epoxy-polyamide resin, nitrocellulose melamine resin, the amount polyester resin of macromolecules, and an isocyanate prepolymer, A methacrylate copolymer and the mixture of a diisocyanate prepolymer, They are the mixture of the mixture of polyester polyol and the poly isocyanate, formaldehyde resin, and a low-molecular-weight glycol / amount diol of giant molecules / triphenylmethane triisocyanate, polyamine resin, poly imine resin, such mixture, etc.

[0029] Instantiation of these resin JP,39-8103,B, JP,40-9779,B, JP,41-7192,B, JP,41-8016,B, JP,41-14275,B, JP,42-18179,B, JP,43-12081,B, JP,44-28023,B, JP,45-14501,B, JP,45-24902,B, JP,46-13103,B, It is indicated by official reports, such as JP,47-22065,B, JP,47-22066,B, JP,47-22067,B, JP,47-22072,B, JP,47-22073,B, JP,47-28045,B, JP,47-28048,B, and JP,47-28922,B.

[0030] These thermoplastics, thermosetting resin, and reaction type resin In addition to a main functional group, as a functional group A carboxylic acid (COOM), a sulfinic acid, A sulfenic acid, a sulfonic acid (SO3M), phosphoric acid (PO (OM), (OM)), acidic groups (M — H —), such as phosphonic acid, sulfuric acids (OSO3M), and these ester groups Alkali metal, alkaline earth metal, a hydrocarbon group, and amino acid; Aminosulfonic acid Both-sexes radicals, such as a sulfuric acid of amino alcohol or phosphoric ester, and an alkyl betaine mold, Hydroxyl groups, such as an amino group, an imino group, an imide radical, and an amide group, and an alkoxyl group, A thiol group, an alkylthio group, a halogen radical (F, Cl, Br, I), It is desirable that one or more sorts of less than six-sort implications and each functional group usually contain a silyl radical, a siloxane radical, an epoxy group, an isocyanato group, a cyano group, a nitrile group, an oxo-radical, an acrylic radical, and a phosphoretted hydrogen radical 1x10-6eq-1x10-2eq per 1g of resin.

[0031] And although the above-mentioned binder can be used for the binder of the polish layer of this invention, the binder which has further the functional group which catches a metal ion is included. As a functional group which catches this metal ion, they are an acid functional group or a functional group with a chelate effect, for example. By this functional group, the amount of functional groups which catches the above-mentioned metal ion so that the amount of metal ion contamination from the polish object when grinding a metal may be set to 150 or less ppb by Na, K, and Cr is set up by holding or reducing the impurity ion of a polish object in control or a polish layer. The vinyl chloride / vinyl acetate / 2-acrylamido-2-methyl propane sulfonic acid indicated by JP,5-9843,B as an example of a binder with the functional group which catches this metal ion; the copolymerization ratio 90.0:7.5:2.5, an SO3H100 % of the weight thing, etc. are mentioned.

[0032] In addition, although the free polar group (for example, -SO3H) of the binder with the functional group which catches the above-mentioned metal ion which is not a salt is desirable, it can be used, if there is capacity which catches a metal ion even if it has partially the polar group (for example, -SO3Na) which is a salt. As for a free polar group, it is desirable that the all pole nature machine is contained 10% of the weight or more, and, specifically, it is still more desirable to be contained 30% of the weight or more.

[0033] As poly isocyanate used for the polish layer of this invention Tolylene diisocyanate, 4 and 4'-diphenylmethane diisocyanate, Hexamethylene di-isocyanate, xylylene diisocyanate, naphthylene-1 and 5-diisocyanate, Ortho toluidine diisocyanate, isophorone diisocyanate, triphenylmethane triisocyanate, Isocyanates, such as isophorone diisocyanate, a product with the isocyanates concerned and polyalcohol, An end functional group can use what is isocyanate by the product of the poly isocyanate of 2 - 10 ****, the poly isocyanate, and polyurethane which were generated by the condensation of isocyanates. The thing of 100-20000 is suitable for the average molecular weight of these poly isocyanates.

[0034] As a trade name by which these poly isocyanate is marketed Coronate L, Coronate HL, coronate 2030, coronate 2031, milli ONETO MR, Milli ONETO MTL (above Japanese polyurethane company make), bamboo NETO D-102, D-110 N bamboo NETO, Bamboo NETO D-200, bamboo NETO D-202, bamboo NETO 300S, Bamboo NETO 500 (above Takeda Chemical, Ltd. make), Sumi Joule T-80, Sumi Joule 44S, SUMIJURU PF, Sumi Joule L, Sumi Joule N, Desmodur L Desmodur IL, Desmodur N, Desmodur HL, Desmodur T65, Desmodur 15, Desmodur R There are Desmodur RF, Desmodur SL, Desmodur Z4273 (above the Sumitomo Bayer make), etc., and these can be used with two or the combination beyond it using an independent or hardening reactant difference.

[0035] Moreover, catalysts, such as a catalyst of compound metallurgy group oxide, iron acetylacetonate, etc. which have a hydroxyl group (butanediol, hexandiol, and molecular weight are the polyurethane of 1000-10000, water, etc.) and amino groups (monomethylamine, dimethylamine, trimethylamine, etc.), can also be used together in order to promote a hardening reaction. As for the compound which has these hydroxyl groups and amino groups, it is desirable that they are many organic functions. As for these poly isocyanate, it is desirable to use a polish layer and a back layer per [2] total amount 100 weight section of binder resin and the poly isocyanate - in 70 weight sections, and it is 5 - 50 weight section more preferably. These instantiation is shown in official reports, such as JP,60-131622,A and JP,61-74138,A.

[0036] In addition, the compound which had various kinds of functions in the polish layer is added as an additive. For example, a dispersant, lubricant, an antistatic agent, an antioxidant, an antifungal agent, a coloring agent, a solvent, etc. are added.

[0037] As powdered lubricant used for the polish layer of this invention, there is resin impalpable powder, such as non-subtlety powder, such as graphite, molybdenum disulfide, boron nitride, graphite fluoride, a calcium carbonate, a barium sulfate, oxidization silicon, titanium oxide, a zinc oxide, tin oxide, and a tungsten disulfide, acrylic styrene resin impalpable powder, benzoguanamine system resin impalpable powder, melamine system resin impalpable powder, polyolefine system resin impalpable powder, polyester system resin impalpable powder, polyamide system resin impalpable powder, polyimide system resin impalpable powder, and the poly hooker ethylene system resin impalpable powder, etc.

[0038] moreover — as organic compound system lubricant — a silicone oil (a dialkyl polysiloxane —) A dialkoxy polysiloxane, a phenyl polysiloxane, a fluoro alkyl polysiloxane (KF96 by the Shin-etsu chemistry company, KF69 grade), a fatty-acid denaturation silicone oil, fluorine alcohol, and polyolefine (polyethylene wax —) Polyglycols, such as polypropylene (ethylene glycol, polyethylene oxide wax, etc.), A tetrafluoroethylene oxide wax, a poly tetrafluoro glycol, Perfluoro alkyl ether, a perfluoro fatty acid, perfluoro fatty acid ester, A perfluoroalkyl sulfate, a perfluoroalkyl sulfonate, The compound which introduced fluorine and silicon, such as perfluoroalkyl benzenesulfonic acid ester and perfluoroalkyl phosphoric ester, Alkyl-sulfuric-acid ester, an alkyl sulfonate, alkyl phosphonic acid triester, Alkyl phosphonic acid monoester, alkyl phosphonic acid diester, An organic acid and organic-acid ester compounds, such as alkyl phosphoric ester and succinate, TORIAZA indolizine, a tetraaza indene, benzotriazol, The complex (hetero) ring compound containing nitrogen and sulfur, such as benzotriazine, benzodiazole, and EDTA, The a little salt machine nature fatty acid of carbon numbers 10-40, the alcohol of the monovalence of 2-40 carbon numbers, or the alcohol of bivalence, The fatty acid ester it is incomparable from any one of trivalent alcohol, tetravalent alcohol, and the alcohol of 6 **, or two or more The fatty acid of the fatty acid ester and the carbon numbers 8-40 which consist of alcohol of monovalence - 6 ** with which it totals with the carbon number of the a little salt machine nature fatty acid of ten or more carbon numbers and this fatty acid, and a carbon number becomes 11-70 pieces or fatty-acid amides, fatty-acid alkylamide, and fatty alcohol can be used.

[0039] As a concrete example of these compounds, caprylic-acid butyl, caprylic-acid octyl, Lauric-acid ethyl, lauric-acid butyl, lauric-acid octyl, myristic-acid ethyl, Myristic-acid butyl, myristic-acid octyl, myristic-acid 2 ethylhexyl, Palmitic-acid ethyl, palmitic-acid butyl, palmitic-acid octyl, Palmitic-acid 2 ethylhexyl, stearin acid ethyl, butyl stearate, Stearin acid isobutyl, stearin acid octyl, stearin acid 2 ethylhexyl, Stearin acid amyl, stearin acid isoamyl, stearin acid 2 ethyl pentyl, Stearin acid 2 hexyl DESHIRU, stearin acid iso tridecyl, octadecanamide, Stearin acid alkylamide, stearin acid butoxy ethyl, anhydro sorbitan monostearate, Anhydro sorbitan distearate, anhydro sorbitan tristearate, independent [be / anhydro sorbitan tetra-stearate, oleyl olate, oleyl alcohol, lauryl alcohol, a montan wax, carnauba wax, etc. / and] — or it can be combined and used.

[0040] Moreover, as lubricant used for this invention, it can be used in that lubricating oil additive is also independent or combination. the anti-oxidant (alkylphenol and benzotriazine —) known as a rusr-proofer A tetraaza indene, sulfamide, guanidine, a nucleic acid, a pyridine, metal chelating agents, such as an amine, a hydroquinone, and EDTA, and a **** agent (a naphthenic acid —) oily agents (rapeseed oil —), such as an alkenyl succinic acid, phosphoric acid, and dilauryl phosphate Lauryl alcohol etc. has an extreme pressure agent, detergent dispersants (a dibenzyl sulfide, tricresyl phosphate, tributyl phosphite, etc.), a viscosity index improver, a pour point depressant, a **** agent, etc. These lubricant is added in the range of 0.01 - 30 weight section to the binder 100 weight section. About these, JP,43-23889,B, JP,48-24041,B, JP,48-18482,B, JP,44-18221,B, JP,47-28043,B, JP,57-56132,B, JP,59-8136,A, JP,59-8139,A, JP,61-85621,A, a U.S. Pat. No. 3423233 number, a U.S. Pat. No. 3470021 number, A U.S. Pat. No. 3492235 number, a U.S. Pat. No. 3497411 number, a U.S. Pat. No. 3523086 number, A U.S. Pat. No. 3625760 number, a U.S. Pat. No. 3630772 number, a U.S. Pat. No. 3634253 number, A U.S. Pat. No. 3642539 number, a U.S. Pat. No. 3687725 number, a U.S. Pat. No. 4135031 number, a U.S. Pat. No. 4497864 number, a U.S. Pat. No. 4552794 number, and IBM — technical disk Roger Britten (IBM Technical Disclosure Bulletin) Vol.9, and No7 and p779 (December, 1966) — It is indicated by Maruzen stock issue etc. in -967 or erection RONIKU (ELEKTRONIK) 1961 year No12, p380, chemistry handbook, application section, and p954 1980.

[0041] As the dispersant used for this invention, and a distributed assistant A caprylic acid, a capric acid, a lauric acid, a myristic acid, a palmitic acid, Stearin acid, oleic acid, an elaidic acid, linolic acid, a linolenic acid, the fatty acid (R — 1 COOH) of 2-40 carbon numbers, such as a steer roll acid, behenic acid, a maleic acid, and a phthalic acid R1 The alkyl group of 1-39 carbon numbers, a phenyl group, an aralkyl radical, The metallic soap (copper oleate), the fatty-acid amide which consist of the alkali metal (Li, Na, K, NH4+, etc.) of the aforementioned fatty acid or alkaline earth metal (Mg, calcium, Ba, etc.), Cu, Pb, etc.; lecithin (soybean-oil lecithin) etc. is used. In addition, the higher alcohol (a butanol, octyl alcohol, myristyl alcohol, stearyl alcohol) of carbon numbers 4-40 and these sulfates, a sulfonic acid, a phenyl sulfonic acid, an alkyl sulfonic acid, a sulfonate, phosphoric acid monoester, a phosphodiester, phosphoric acid triester, alkyl phosphonic acid, phenylphosphonic acid, an amine compound, etc. are usable. Moreover, a polyethylene glycol, polyethylene oxide, sulfo succinic acid, a sulfo succinic acid metal salt, sulfo succinate, etc. are usable. These dispersants are usually used by one or more kinds, and one kind of dispersant is added in the range of 0.005 - 20 weight section to the binder 100 weight section. The operation of these dispersants may be made to put on the front face of an abrasive material or non-grinding impalpable powder beforehand, and is in the middle of distributed, and may be added. Such a thing is shown in JP,39-28369,B, JP,44-17945,B, JP,44-18221,B, JP,48-7441,B, JP,48-15001,B, JP,48-15002,B, JP,48-16363,B, JP,49-39402,B, a U.S. Pat. No. 3387993 number, said 3470021 numbers, etc.

[0042] as the antifungal agent used for this invention — a 2-(4-thiazolyl)-benzimidazole N-(fluoro dichloro methylthio)-phthalimide, 10 and the 10'-oxy-screw FENOKI sarcine, 2, 4, 5 and 6 tetra-chloro isophthalonitrile, P-tolyl diiodomethyl sulfone, triiodo allyl alcohol, a dihydroaceto acid, phenyl oleic acid mercury, an oxidization screw (tributyl tin), and a SARUCHIRUA scallion -- there is id etc. Such a thing is shown in for example, Kougaskutosho, "chemistry and industrial" 32,904 (1979), etc. in "microorganism disaster and prevention technical" 1972.

[0043] As an antistatic agent used for this invention, carbon black can be used, for example, the furnace for rubber, the black for thermal ** colors for rubber, acetylene black, etc. can be used. the specific surface area — 5-500m2 / g, and DBP oil absorption — 10-400ml / 100g, and pH -- 2-10, and water content — 0.1 - 10%, and tap density — 0.1 - 1 g/cm2 it is — a thing is desirable. as the concrete example of this carbon black — the Cabot Corp. make — :BLACKPEARLS 2000, 1300, 1000, 900, 800, 700, and :by Mitsubishi Kasei industrial company 650B, 950B, 3250B, 850, 900, 960, 980, 1000, 2300 and 2400, and 2600 grades are raised. Moreover, surface treatment of the carbon black can be carried out with a dispersant etc., or what was graphite-ized by resin can also be used.

[0044] As antistatic agents other than the carbon black used for this invention Graphite, denaturation graphite, a carbon black graft polymer, Natural surfactants [, such as a conductive powder; saponin], such as tin oxide-antimony oxide, tin oxide, and titanium oxide-tin oxide-antimony oxide; An alkylene oxide system, A glycerol system, a glycidol system, polyhydric alcohol, polyhydric-alcohol ester, Nonionic surface active agents, such as an alkylphenol EO adduct; High-class alkylamines An annular amine, a hydantoin derivative, an amide amine, an ester amide, Cationic surface active agents, such as quaternary ammonium salt, heterocycles of a pyridine and others, phosphonium, or sulfonium; A carboxylic acid, A sulfonic acid, phosphonic acid, phosphoric acid, a sulfate radical, phosphonate, The anionic surface active agent; amino acid containing acidic groups, such as a phosphoric ester radical; amphoteric surface active agents, such as a sulfuric acid of aminosulfonic acid and amino alcohol or phosphoric ester, and an alkyl betaine mold, etc. are used.

[0045] A part of example of a surfactant compound which can be used as these antistatic agents JP,60-28025,A, a U.S. Pat. No. 2271623 number, said 2240472 numbers, said -- No. 2288226 -- said -- No. 2676122 -- said -- No. 2676924 -- said -- No. 2676975 said -- No. 2691566 -- said -- No. 2727860 -- said -- No. 2730498 -- said -- No. 2742379 said -- No. 2739891 -- said -- No. 3068101 -- said -- No. 3158484 -- said -- No. 3201253 said -- No. 3210191 -- said -- No. 3294540 -- said -- No. 3415649 -- said -- No. 3441413 Said 3442654 numbers, said 3475174 numbers, said 3545974 numbers, the West German patent public presentation No. 1942665 (OLS), British JP,1077317,B, said 1198450 numbers, etc. are begun. Work besides Ryohei Oda "composition and application of a surfactant" ; "surface written by A.W. Bailey (Maki Shoten Publishing 1972 edition) active age ENTSU" () [Interscience] publication Condominium lei TEDDO 1985 edition; T. "encyclopedia written by P. SHISURI OBU surface -- active It is indicated by Saiwai Shobo (1968) written by [EJIENTSU and sixth ** / of 2nd volume"(chemical pub RISHU company 1964 edition); a "surfactant handbook" / (Sangyo Tosho Publishing Co., Ltd., December 20, Showa 41);] Hideo Marumo "an antistatic agent" etc.

[0046] these surfactants are independent -- or you may mix and add. The amount of these surfactants used in a polish object is per [0.01] abrasive material 100 weight section - 10 weight sections. Moreover, the amount of the back layer used is per [0.01] binder 100 weight section - 30 weight sections. Although these are used as an antistatic agent, it may sometimes be applied as the other purposes, for example, amelioration of distribution, lubricative amelioration, a spreading assistant, a wetting agent, a hardening accelerator, and a distributed accelerator.

[0047] As an organic solvent used in the case of distribution of this invention, kneading, and spreading By the ratio of arbitration, an acetone, a methyl ethyl ketone, methyl isobutyl ketone, Ketone systems, such as a cyclohexanone, an isophorone, and a tetrahydrofuran; A methanol, Ethanol, propanol, a butanol, isobutyl alcohol, isopropyl alcohol, Alcoholic systems, such as methyl cyclohexanol; Methyl acetate, ethyl acetate, Ester systems, such as butyl acetate, isobutyl acetate, isopropyl acetate, ethyl lactate, and the acetic-acid glycol monoethyl ether; Diethylether, A tetrahydrofuran, glycol wood ether, the glycol monoethyl ether, Ether systems, such as dioxane; Benzene, toluene, a xylene, cresol, Tar systems, such as chlorobenzene and styrene (aromatic hydrocarbon); A methylene chloride, Chlorinated hydrocarbons, such as ethylene chloride, a carbon tetrachloride, chloroform, ethylene chlorohydrine, and dichlorobenzene, N and N-dimethyl formaldehyde, a hexane, etc. can be used. Moreover, these solvents are usually used by the ratio of arbitration at two or more sorts. Moreover, the impurities (the polymerization object of a solvent own [the], moisture, raw material component, etc.) of a minute amount may also be included in 1 or less % of the weight of an amount. Drainage system solvents (water, alcohol, acetone, etc.) can also be used instead of an organic solvent.

[0048] It dissolves in an organic solvent at arbitration combining the above-mentioned presentation etc., and formation of a polish layer is applied and dried on a base material as a spreading solution. This base material has flexibility and thickness is about (when it has the shape of a disk or a card, thickness is about 0.03-10mm) 50-300 micrometers. As a material, ceramics, such as metals, such as aluminum and copper, and glass, paper, etc. can be used other than plastics, such as vinyl system resin, such as cellulosics, such as polyolefines, such as polyester, such as polyethylene terephthalate and polyethylenenaphthalate, and polypropylene, cellulose triacetate, and cellulose die acetate, and a polyvinyl chloride, a polycarbonate, polyimide, a polyamide, and polysulfone. These base materials may perform corona discharge treatment, plasma treatment, undercoat processing, heat treatment, dust-removing dust processing, metal vacuum evaporationo processing, and alkali treatment in advance of spreading. These base materials are indicated in West German JP,3338854,B A, JP,59-116926,A, JP,61-129731,A, and U.S. Pat. No. 4388368 number; Yukio Mitsuishi work, "fiber and industrial" 31 volume, p50 - 1975 [55,], etc., for example. Center line average surface roughness Ra of these base materials has desirable 0.001-5.0 micrometers. Moreover, the Young's modulus (F5 value) of these base materials can choose 2 [2-30kg / /] (2 = 9.8Pa of 1 kg/m) for the cross direction and a longitudinal direction mm according to the purpose.

[0049] There is especially no limit in the approach of distribution and kneading, and the addition sequence of each component, the addition location under distribution / kneading (resin, fine particles, lubricant, solvent, etc.), distributed temperature (0-80 degrees C), etc. can be set up suitably. A kneading machine, for example, 2 roll mills, 3 roll mills, a ball mill, a pebble mill, a TRON mill, a Sand grinder, TSUEGUBARI (Szegvari) attritor, a high-speed impeller, a disperser, a high-speed stone mill, a high-speed impact mill, DISUPA, a kneader, a high speed mixer, a ribbon blender, a ko kneader, an intensive mixer, a tumbler, a blender, the De Dis parser, a homogenizer, a monopodium screw extruder a usual 2 shaft screw extruder, a usual ultrasonic disperser, etc. can be used for preparation of a polish coating. Usually, distribution and kneading are equipped with two or more these distributions and kneading machines, and it processes continuously. The detail of the technique about kneading distribution is T.C.PATTON "Paint Flow and Pigment work Dispersion" (paint flow and pigment dispersion) (TE . C . patton) 1964John. Wiley & Sons issue (John wheelie and Suns) and Shin-ichi Tanaka work "an industrial ingredient" 25 volumes are indicated by the bibliography of 37 (1977) etc. and the books concerned. Since distribution and kneading are efficiently advanced as an auxiliary material of these distributions and kneading, the steel ball of the path of 10cm phi-0.05mmphi, a steel bead, a ceramic bead, a glass bead, and an organic polymer bead can be used with a spherical equivalent diameter. Moreover, these ingredients are not restricted to a globular form. Moreover, specifications, such as U.S. Pat. No. 2581414 and 2855156, also have a publication. Kneading distribution can be performed according to the approach indicated by the above-mentioned books, the bibliography of the books concerned, etc. also in this invention, and polish layer coating liquid can be prepared.

[0050] After performing coincidence extrusion (co-extrusion) with a base material in the state of heating melting, or extruding a substrate (base material) and forming membranes as an approach of painting the aforementioned polish layer on up to a base material, a polish layer is painted on the bottom. It cools and rolls round, after carrying out heating extension after carrying out the laminating of the polish layer on a base material as mentioned above, and carrying out orientation extension at 120-160 degrees C. This extension is performed independent [in every direction] and in all directions [both].

[0051] When a polish object is a polish tape, after cutting out the produced polish tape, it rolls round to the reel of a desired plastics metallurgy group. Just before rolling round, in the process before it, it is desirable varnishing and/or to clean the polish object of a polish tape and others. In order to control the surface roughness and the polish force of a polish object, varnishing specifically fails to mutilate the projection part of a polished surface with a hard ingredient like a sapphire cutting edge, a razor cutting edge, a superhard ingredient cutting edge, a diamond cutting edge, and a ceramic cutting edge, and makes it uniformly or smooth. Although eight or more are desirable as for the Mohs hardness of these ingredients, there is especially no limit and it just removes a projection. Especially the configuration of these ingredients does not need to be a cutting edge, and can be used also in a square shape, a round shape, and a configuration like a wheel (these quality of the materials may be given to the cylindrical shape-like perimeter to rotate). Moreover, cleaning of a polish object is performed by carrying out wiping of the polish body surface layer with a nonwoven fabric etc. in order to remove dirt and the excessive lubricant of a polish body surface. As an ingredient of such wiping, various BAIRIN by Japan Vilene Co., Ltd., TORESHI by Toray Industries, Inc., EKUSENU, trade name KIMUWAIPU, the various Fuji Photo Film polish objects, and a nonwoven fabric can use tissue paper etc. for the nonwoven fabric made of nylon, the nonwoven fabric made from polyester, the nonwoven fabric made from rayon, the nonwoven fabric made from acrylonitrile, a mixed nonwoven fabric, etc., for example. These are indicated by JP,46-39309,B, JP,58-46768,B, JP,56-90429,A, JP,58-46767,B,

JP,63-259830,A, JP,1-201824,A, etc.
[0052] About the abrasive material used for this invention, a binder, additives (lubricant, a dispersant, an antistatic agent, a finishing agent, carbon black, an abrasive material, a protection-from-light agent, an anti-oxidant, antifungal agent, etc.), a solvent and a base material (you may have undercoat, a back layer, and back undercoat), or its process, the manufacture approach indicated by JP,56-26890,B etc. can be done in reference.
[0053]
[Example] Below, below the example and the example of a comparison of this invention are shown, and the property is evaluated. In addition, the "section" in an example shows the "weight section."
[0054] The under coat was prepared on the base material by polyethylene terephthalate with a <examples 1-5> thickness of 125 micrometers, on it, kneading distribution was carried out, viscosity control of the following presentation A was carried out to homogeneity, the coating liquid for polish layers which mixed the curing agent was applied and dried, the polish layer was prepared, it started in predetermined magnitude, and the sample of a polish object was produced.

[0055] As shown in the following table 1, an abrasive material is a silica (average grain size: 0.1 micrometers), the amounts (Yx10 - 4Eq/(g)) of the functional group (sulfonic group) of a binder differ, an example 5 is titanium oxide (average grain size: 0.1 micrometers), and the abrasive material of a functional group is [each examples 1-4] the same as that of an example 1. In addition, the functional group of the above-mentioned binder is a functional group (SO3H) with the free whole quantity.
[0056] While grinding aluminum and a silica to coincidence and measuring the level difference of a polished surface with the polish object of the above-mentioned example, the result of having ground the silicon front face and having measured the metal ion concentration on the front face of silicon after polish is shown in the following table 1.
[0057] In the <examples 1-4 of comparison> table 1, the result of having performed the same polish test with the polish object of the examples 1-4 of a comparison is written together. It is the example of the binder which does not contain the functional group which catches a metal ion to said examples 1-4, and the examples 2 and 3 of a comparison are examples of an abrasive material with as high Mohs hardness as 8 or 9, the examples 4 of a comparison are 5 and an example of a low abrasive material, and the Mohs hardness of the binder of the examples 2-4 of a comparison is [the example 1 of a comparison] the same as that of an example 1.
[0058] From the result of Table 1, the level difference in coincidence polish of a dissimilar material can perform 3-5nm and polish it is small and smooth and good with the polish object by this invention examples 1-5, and the result also with the metal ion concentration good at a value with small 80 - 100ppb and amount of contamination on the front face of silicon after polish is obtained. On the other hand, in the example 1 of a comparison, by the functional group which catches a metal ion not being included in a binder, although a level difference is small, the amount of metal ion contamination on the front face of silicon serves as a big value. Moreover, in the examples 2 and 3 of a comparison with the high Morse altitude of an abrasive material, a level difference serves as a big value and the amount of metal ion contamination on the front face of silicon both also serves as a big value from which smooth nature is not obtained. Furthermore, in the example 4 of a comparison with the low Morse altitude of an abrasive material, although a level difference is a small value, the amount of metal ion contamination on the front face of silicon serves as a big value.
[0059]
[-- coating liquid presentation for polish layers: -- A]
An abrasive material (quality of the material: X, average grain size of 0.1 micrometers) 100 section binder (polyester polyurethane:) [neopentyl glycol] A /caprolactone / phthalic acid / diphenylmethane Diisocyanate =3/2.1/4.7/1.0 mol, SO3H 100-% of the weight content, content Yx10-4 eq/g The ten sections Binder (isocyanate) The two sections Dispersant (sulfo succinate) The 0.1 sections Diluent (methyl ethyl ketone) The 150 sections [0060]
[Table 1]

	研磨剤		ﾊﾞｲﾝﾀﾞｰ官能基量	段差	金属ｲｵﾝ濃度
	材質X	モース硬度	$Y\times10^{-4}$eq/g	nm	ppb
実施例1	シリカ	7	10	5	100
実施例2	シリカ	7	4	5	100
実施例3	シリカ	7	1	5	90
実施例4	シリカ	7	0.1	5	100
実施例5	酸化チタン	6	0.1	3	80
比較例1	シリカ	7	なし	5	2500
比較例2	酸化クロム	8	10	45	700
比較例3	アルミナ	9	10	50	1200
比較例4	γFe_2O_3	5	10	0	5000

[0061] A ground object is rotated by 100rpm and the polish conditions in Table 1 are a polish object feed rate 100 mm/min Carrying out, polish time amount is for 30 seconds. After a level difference measurement trial grinds the measuring plane of aluminum and a silica evenly first, it doubles this flat side horizontally, grinds it on the above-mentioned conditions to coincidence, and measures the polished surface level difference of the aluminum and the silica after polish. Moreover, measurement of metal ion concentration grinds a silicon front face for 30 seconds on the above-mentioned conditions, and measures the metal ion concentration on this front face of silicon.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the polish object for semi-conductor polish which comes to prepare the polish layer which comes to distribute an abrasive material to a binder on a flexible base material, and is formed by a semi-conductor metal especially aluminum, silicon, copper, photoresist material, etc.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] Conventionally, although polish of a semi-conductor is ground using the polish slurry of a scouring pad and abrasive material content, in order to grind many dissimilar materials, in the yield etc., sufficient result is not necessarily obtained. That is, in what uses a polish slurry, there are many abrasive materials which do not contribute to polish, polish effectiveness is low, and the increase in efficiency is demanded.
[0003] Moreover, in what is depended only on the hard abrasive material to which the Mohs hardness currently used with the polish object for the conventional magnetic-head polish etc. exceeds 7, since glass is used for the semi-conductor silicon wafer as the ground body, even if it adjusts the particle diameter, a blemish occurs in a polished surface and it cannot perform good polish.
[0004] Moreover, the technique of the polish object which prevents that originate in the hardness difference and a level difference arises in a polished surface as an object for surface polish of the optical connecter ferrule which consisted of materials for which the degrees of hardness which consist of glass and a ceramic differ is indicated by JP,9-248771,A. The silica particle whose mean particle diameter is 5-30mmicro as an abrasive material is used for this polish object, and it is made for center line average surface roughness Ra of a polish layer front face to be set to 0.005-0.2 micrometers.
[0005] On the other hand, by what is shown in JP,1-264776,A, that to which Mohs hardness carried out mixed use of the 2nd 8.5 or more abrasive materials with the 1st abrasive material of 5-7, and Mohs hardness set the mean particle diameter to 0.07-0.40 micrometers as the abrasive material is indicated as the magnetic head or a polish object for hard disk polish.

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EFFECT OF THE INVENTION

[Effect of the Invention] According to above this inventions, the abrasive material particle in a polish layer can consider as the small super-Taira glide plane of a level difference from which center line average surface roughness Ra after grinding the semi-conductor substrate front face which consists of many dissimilar materials by including the fine particles whose average grain size is 40-1000nm 60% or more is set to 5nm or less with Mohs hardness 6-7.
[0014] In that case, the degree of hardness resembles a semi-conductor by the abrasive material of the silica of Mohs hardness 6-7, a zirconia, titanium oxide, cerium oxide, red ocher, and a garnet which contains a kind at least being included 60% or more, and polish control can be easily performed by moderate polish time amount.
[0015] If center line average surface roughness Ra of the front face of a polish layer is especially set to 1-5000nm, the further super-Taira glide plane of the ground body will be obtained.
[0016] Moreover, the amount of metal ion contamination from the polish object when grinding a metal by holding or reducing the impurity ion of a polish object in control or a polish layer is 150 or less ppb by Na, K, and Cr by including the binder which has the functional group which catches a metal ion in the binder of a polish layer. It can prevent that the ion poured into a semi-conductor decreases the life of a carrier electron by this.
[0017] Compared with what uses a polish slurry, efficient polish with the high yield can be performed because it is furthermore polish of the ground body with a polish object.
[0018]
[Embodiment of the Invention] Below the gestalt of operation of the polish object of this invention is shown, and this invention is further explained to it at a detail.
[0019] On the flexible base material according [the polish object of this invention] to polyester film etc., it comes to prepare the polish layer to which the silica of Mohs hardness 6-7, a zirconia, titanium oxide, cerium oxide, red ocher, and an average grain size of a garnet according to a kind at least distributed the abrasive material which contains the abrasive material which is 40-1000nm 60% or more to the binder, and the above-mentioned binder contains a binder with the functional group which catches a metal ion. Moreover, center line average surface roughness Ra of said polish layer front face is 1-5000nm.
[0020] On the other hand, it prepares so that Na, K, and Cr may be set to 150 or less ppb, and as a functional group which catches the metal ion in said binder, the amount of metal ion contamination from the polish object when grinding a metal is an acid functional group or a functional group with a chelate effect, and uses as a binder the compound which has these functional groups.
[0021] Moreover, it carries out, where one side that there is little polish object or ground body is rotated in polish of the ground body (semi-conductor substrate), and rotational speed is ten or more rpm, and the feed rates of a polish object are 10 mm/min. It carries out above. It also has the effectiveness that migration of this polish object removes polish or **.
[0022] The abrasive material impalpable powder used in the polish layer of this invention contains the abrasive material whose average grain size 60% or more of a fine-particles total amount is Mohs hardness 6-7, and is 40-1000nm. as the abrasive material of this Mohs hardness 6-7 — the inside of a silica (Mohs hardness 7), a zirconia (Mohs hardness 7), titanium oxide

(Mohs hardness 6-7), cerium oxide (Mohs hardness 7), red ocher (Mohs hardness 6), and a garnet (Mohs hardness 7) — at least — a kind — it is .

[0023] Fine particles other than the above blended with a polish layer (abrasive material) are the ingredients which generally have scouring or the Takuma operation, they are alpha-alumina, gamma-alumina, alpha, gamma-alumina, a melting alumina, silicon carbide, chrome oxide, corundum, a man made diamond, a diamond, alpha-ferrous oxide, silicon nitride, boron nitride, carbonization molybdenum, boron carbide, tungsten carbide, a titanium carbide, etc., and a with a Mohs hardness of seven or more ingredient can mainly use them in the combination to four sorts of ** in one. As for these abrasive materials, the thing of the magnitude whose average grain size is 40-1000nm is used. In the case of a polish layer, these abrasive materials are used in the range of a binder 10 - the 1000 weight sections to the abrasive material 100 weight section.

[0024] As an example of an abrasive material, AKP1, AKP15, AKP20, AKP30, AKP50, AKP80, Hit50, Hit100, etc. by Sumitomo Chemical Co., Ltd. are mentioned. These are indicated by JP,52-28642,B, JP,49-39402,B, JP,63-98828,A, a U.S. Pat. No. 3687725 number, a U.S. Pat. No. 3007807 number, a U.S. Pat. No. 3041196 number, a U.S. Pat. No. 3293066 number, a U.S. Pat. No. 3630910 number, a U.S. Pat. No. 3833412 number, a U.S. Pat. No. 4117190 number, British JP,1145349,B, West German JP,853211,B, etc.

[0025] As a binder used for the polish layer of this invention, well-known thermoplastics, thermosetting resin, reaction type resin, electron ray hardening mold resin, ultraviolet curing mold resin, visible-ray hardening mold resin, and such mixture are used conventionally.

[0026] As thermoplastics, 200 degrees C or less and average molecular weight are [10000-300000 and polymerization degree] about 50 to about 2000, and softening temperature is 200 to about 800 more preferably. For example, a vinyl chloride vinyl acetate copolymer, a vinyl chloride copolymer, a vinyl chloride vinyl acetate vinyl alcohol copolymer, A vinyl chloride vinyl alcohol copolymer, a vinyl chloride vinylidene chloride copolymer, A vinyl chloride acrylonitrile copolymer, an acrylic ester acrylonitrile copolymer, An acrylic ester vinylidene-chloride copolymer, an acrylic ester styrene copolymer, A methacrylic ester acrylonitrile copolymer, a methacrylic ester vinylidene-chloride copolymer, A methacrylic ester styrene copolymer, urethane elastomer, nylon-silicon system resin, Nitrocellulose-polyamide resin, poly hooker vinyl, a vinylidene-chloride acrylonitrile copolymer, Butadiene Acrylonitrile, polyamide resin, a polyvinyl butyral, a cellulosic (cellulose acetate butylate and cellulose die acetate —) Cellulose triacetate, cellulose propionate, a nitrocellulose, Ethyl cellulose, methyl cellulose, a propyl cellulose, methylethylcellulose, A styrene butadiene copolymer, such as a carboxymethyl cellulose and an acetyl cellulose, Various kinds of thermoplastics of a synthetic-rubber system, such mixture, etc., such as polyester resin, polycarbonate resin, a chloro vinyl ether acrylic ester copolymer, amino resin, and polyamide resin, are used.

[0027] Instantiation of these resin JP,37-6877,B, JP,39-12528,B, JP,39-19282,B, JP,40-5349,B, JP,40-20907,B, JP,41-9463,B, JP,41-14059,B, JP,41-16985,B, JP,42-6428,B, JP,42-11621,B, JP,43-4623,B, JP,43-15206,B, JP,44-2889,B, JP,44-17947,B, JP,44-18232,B, JP,45-14020,B, JP,45-14500,B, JP,47-18573,B, JP,47-22063,B, JP,47-22064,B, JP,47-22068,B, JP,47-22069,B, JP,47-22070,B, JP,47-27886,B, JP,57-133521,A, JP,58-137133,A, JP,58-166533,A, JP,58-222433,A, JP,59-58642,A, etc. are indicated by the official report of a U.S. Pat. No. 4571364 number and a U.S. Pat. No. 4752530 number etc.

[0028] As thermosetting resin or reaction type resin, in the state of coating liquid, it is 200000 or less molecular weight, and that from which molecular weight becomes infinite by reactions, such as condensation and addition, is suitable by carrying out heating humidification after spreading and desiccation. Moreover, what will not be softened or fused in these resin by the time resin pyrolyzes is desirable. Specifically For example, phenol resin, phenoxy resin, an epoxy resin, Polyurethane resin, polyester resin, polyurethane polycarbonate resin, A urea-resin, melamine resin, an alkyd resin, silicon resin, acrylic reaction resin (electron ray hardening resin), The mixture of epoxy-polyamide resin, nitrocellulose melamine resin, the amount polyester resin of macromolecules, and an isocyanate prepolymer, A methacrylate copolymer and the mixture of a diisocyanate prepolymer, They are the mixture of the mixture of polyester polyol and the poly isocyanate, formaldehyde resin, and a low-molecular-weight glycol / amount diol of giant

molecules / triphenylmethane triisocyanate, polyamine resin, poly imine resin, such mixture, etc.
[0029] Instantiation of these resin JP,39-8103,B, JP,40-9779,B, JP,41-7192,B, JP,41-8016,B, JP,41-14275,B, JP,42-18179,B, JP,43-12081,B, JP,44-28023,B, JP,45-14501,B, JP,45-24902,B, JP,46-13103,B, It is indicated by official reports, such as JP,47-22065,B, JP,47-22066,B, JP,47-22067,B, JP,47-22072,B, JP,47-22073,B, JP,47-28045,B, JP,47-28048,B, and JP,47-28922,B.
[0030] These thermoplastics, thermosetting resin, and reaction type resin In addition to a main functional group, as a functional group A carboxylic acid (COOM), a sulfinic acid, A sulfenic acid, a sulfonic acid (SO3M), phosphoric acid (PO (OM), (OM)), acidic groups (M — H —), such as phosphonic acid, sulfuric acids (OSO3M), and these ester groups Alkali metal, alkaline earth metal, a hydrocarbon group, and amino acid; Aminosulfonic acid Both-sexes radicals, such as a sulfuric acid of amino alcohol or phosphoric ester, and an alkyl betaine mold, Hydroxyl groups, such as an amino group, an imino group, an imide radical, and an amide group, and an alkoxyl group, A thiol group, an alkylthio group, a halogen radical (F, Cl, Br, I), It is desirable that one or more sorts of less than six-sort implications and each functional group usually contain a silyl radical, a siloxane radical, an epoxy group, an isocyanato group, a cyano group, a nitrile group, an oxo-radical, an acrylic radical, and a phosphoretted hydrogen radical 1x10-6eq-1x10-2eq per 1g of resin.
[0031] And although the above-mentioned binder can be used for the binder of the polish layer of this invention, the binder which has further the functional group which catches a metal ion is included. As a functional group which catches this metal ion, they are an acid functional group or a functional group with a chelate effect, for example. By this functional group, the amount of functional groups which catches the above-mentioned metal ion so that the amount of metal ion contamination from the polish object when grinding a metal may be set to 150 or less ppb by Na, K, and Cr is set up by holding or reducing the impurity ion of a polish object in control or a polish layer. The vinyl chloride / vinyl acetate / 2-acrylamido-2-methyl propane sulfonic acid indicated by JP,5-9843,B as an example of a binder with the functional group which catches this metal ion; the copolymerization ratio 90.0:7.5:2.5, an SO3H100 % of the weight thing, etc. are mentioned.
[0032] In addition, although the free polar group (for example, -SO3H) of the binder with the functional group which catches the above-mentioned metal ion which is not a salt is desirable, it can be used, if there is capacity which catches a metal ion even if it has partially the polar group (for example, -SO3Na) which is a salt. As for a free polar group, it is desirable that the all pole nature machine is contained 10% of the weight or more, and, specifically, it is still more desirable to be contained 30% of the weight or more.
[0033] As poly isocyanate used for the polish layer of this invention Tolylene diisocyanate, 4 and 4'-diphenylmethane diisocyanate, Hexamethylene di-isocyanate, xylylene diisocyanate, naphthylene-1 and 5-diisocyanate, Ortho toluidine diisocyanate, isophorone diisocyanate, triphenylmethane triisocyanate, Isocyanates, such as isophorone diisocyanate, a product with the isocyanates concerned and polyalcohol, An end functional group can use what is isocyanate by the product of the poly isocyanate of 2 - 10 ****, the poly isocyanate, and polyurethane which were generated by the condensation of isocyanates. The thing of 100-20000 is suitable for the average molecular weight of these poly isocyanates.
[0034] As a trade name by which these poly isocyanate is marketed Coronate L, Coronate HL, coronate 2030, coronate 2031, milli ONETO MR, Milli ONETO MTL (above Japanese polyurethane company make), bamboo NETO D-102, D-110 N bamboo NETO, Bamboo NETO D-200, bamboo NETO D-202, bamboo NETO 300S, Bamboo NETO 500 (above Takeda Chemical, Ltd. make), Sumi Joule T-80, Sumi Joule 44S, SUMIJURU PF, Sumi Joule L, Sumi Joule N, Desmodur L Desmodur IL, Desmodur N, Desmodur HL, Desmodur T65, Desmodur 15, Desmodur R There are Desmodur RF, Desmodur SL, Desmodur Z4273 (above the Sumitomo Bayer make), etc., and these can be used with two or the combination beyond it using an independent or hardening reactant difference.
[0035] Moreover, catalysts, such as a catalyst of compound metallurgy group oxide, iron acetylacetonate, etc. which have a hydroxyl group (butanediol, hexandiol, and molecular weight are the polyurethane of 1000-10000, water, etc.) and amino groups (monomethylamine, dimethylamine, trimethylamine, etc.), can also be used together in order to promote a hardening

reaction. As for the compound which has these hydroxyl groups and amino groups, it is desirable that they are many organic functions. As for these poly isocyanate, it is desirable to use a polish layer and a back layer per [2] total amount 100 weight section of binder resin and the poly isocyanate - in 70 weight sections, and it is 5 - 50 weight section more preferably. These instantiation is shown in official reports, such as JP,60-131622,A and JP,61-74138,A.

[0036] In addition, the compound which had various kinds of functions in the polish layer is added as an additive. For example, a dispersant, lubricant, an antistatic agent, an antioxidant, an antifungal agent, a coloring agent, a solvent, etc. are added.

[0037] As powdered lubricant used for the polish layer of this invention, there is resin impalpable powder, such as non-subtlety powder, such as graphite, molybdenum disulfide, boron nitride, graphite fluoride, a calcium carbonate, a barium sulfate, oxidization silicon, titanium oxide, a zinc oxide, tin oxide, and a tungsten disulfide, acrylic styrene resin impalpable powder, benzoguanamine system resin impalpable powder, melamine system resin impalpable powder, polyolefine system resin impalpable powder, polyester system resin impalpable powder, polyamide system resin impalpable powder, polyimide system resin impalpable powder, and the poly hooker ethylene system resin impalpable powder, etc.

[0038] moreover — as organic compound system lubricant — a silicone oil (a dialkyl polysiloxane —) A dialkoxy polysiloxane, a phenyl polysiloxane, a fluoro alkyl polysiloxane (KF96 by the Shin-etsu chemistry company, KF69 grade), a fatty-acid denaturation silicone oil, fluorine alcohol, and polyolefine (polyethylene wax —) Polyglycols, such as polypropylene (ethylene glycol, polyethylene oxide wax, etc.), A tetrafluoroethylene oxide wax, a poly tetrafluoro glycol, Perfluoro alkyl ether, a perfluoro fatty acid, perfluoro fatty acid ester, A perfluoroalkyl sulfate, a perfluoroalkyl sulfonate, The compound which introduced fluorine and silicon, such as perfluoroalkyl benzenesulfonic acid ester and perfluoroalkyl phosphoric ester, Alkyl-sulfuric-acid ester, an alkyl sulfonate, alkyl phosphonic acid triester, Alkyl phosphonic acid monoester, alkyl phosphonic acid diester, An organic acid and organic-acid ester compounds, such as alkyl phosphoric ester and succinate, TORIAZA indolizine, a tetraaza indene, benzotriazol, The complex (hetero) ring compound containing nitrogen and sulfur, such as benzotriazine, benzodiazole, and EDTA, The a little salt machine nature fatty acid of carbon numbers 10-40, the alcohol of the monovalence of 2-40 carbon numbers, or the alcohol of bivalence, The fatty acid ester it is incomparable from any one of trivalent alcohol, tetravalent alcohol, and the alcohol of 6 **, or two or more The fatty acid of the fatty acid ester and the carbon numbers 8-40 which consist of alcohol of monovalence - 6 ** with which it totals with the carbon number of the a little salt machine nature fatty acid of ten or more carbon numbers and this fatty acid, and a carbon number becomes 11-70 pieces or fatty-acid amides, fatty-acid alkylamide, and fatty alcohol can be used.

[0039] As a concrete example of these compounds, caprylic-acid butyl, caprylic-acid octyl, Lauric-acid ethyl, lauric-acid butyl, lauric-acid octyl, myristic-acid ethyl, Myristic-acid butyl, myristic-acid octyl, myristic-acid 2 ethylhexyl, Palmitic-acid ethyl, palmitic-acid butyl, palmitic-acid octyl, Palmitic-acid 2 ethylhexyl, stearin acid ethyl, butyl stearate, Stearin acid isobutyl, stearin acid octyl, stearin acid 2 ethylhexyl, Stearin acid amyl, stearin acid isoamyl, stearin acid 2 ethyl pentyl, Stearin acid 2 hexyl DESHIRU, stearin acid iso tridecyl, octadecanamide, Stearin acid alkylamide, stearin acid butoxy ethyl, anhydro sorbitan monostearate, Anhydro sorbitan distearate, anhydro sorbitan tristearate, independent [be / anhydro sorbitan tetra-stearate, oleyl olate, oleyl alcohol, lauryl alcohol, a montan wax, carnauba wax, etc. / and] — or it can be combined and used.

[0040] Moreover, as lubricant used for this invention, it can be used in that lubricating oil additive is also independent or combination. the anti-oxidant (alkylphenol and benzotriazine —) known as a rusr-proofer A tetraaza indene, sulfamide, guanidine, a nucleic acid, a pyridine, metal chelating agents, such as an amine, a hydroquinone, and EDTA, and a **** agent (a naphthenic acid —) oily agents (rapeseed oil —), such as an alkenyl succinic acid, phosphoric acid, and dilauryl phosphate Lauryl alcohol etc. has an extreme pressure agent, detergent dispersants (a dibenzyl sulfide, tricresyl phosphate, tributyl phosphite, etc.), a viscosity index improver, a pour point depressant, a **** agent, etc. These lubricant is added in the range of 0.01 - 30 weight section to the binder 100 weight section. About these, JP,43-23889,B, JP,48-24041,B, JP,48-18482,B, JP,44-18221,B, JP,47-28043,B, JP,57-56132,B, JP,59-8136,A, JP,59-8139,A, JP,61-85621,A, a U.S. Pat. No. 3423233 number, a U.S. Pat. No. 3470021 number, A U.S. Pat. No. 3492235 number, a U.S. Pat. No. 3497411 number, a U.S. Pat. No. 3523086 number, A U.S. Pat. No. 3625760 number, a U.S. Pat. No. 3630772 number, a U.S. Pat. No. 3634253 number, A U.S. Pat. No. 3642539 number, a U.S. Pat. No. 3687725 number, a U.S. Pat. No. 4135031 number, a U.S. Pat. No. 4497864 number, a U.S. Pat. No. 4552794 number, and IBM — technical disk Roger Britten (IBM Technical Disclosure Bulletin) Vol.9, and No7 and p779 (December, 1966) — It is indicated by Maruzen stock issue etc. in -967 or erection RONIKU (ELEKTRONIK) 1961 year No12, p380, chemistry handbook, application section, and p954 1980.

[0041] As the dispersant used for this invention, and a distributed assistant A caprylic acid, a capric acid, a lauric acid, a myristic acid, a palmitic acid, Stearin acid, oleic acid, an elaidic acid, linolic acid, a linolenic acid, the fatty acid (R — 1 COOH) of 2-40 carbon numbers, such as a steer roll acid, behenic acid, a maleic acid, and a phthalic acid R1 The alkyl group of 1-39 carbon numbers, a phenyl group, an aralkyl radical, The metallic soap (copper oleate), the fatty-acid amide which consist of the alkali metal (Li, Na, K, NH4+, etc.) of the aforementioned fatty acid or alkaline earth metal (Mg, calcium, Ba, etc.), Cu, Pb, etc.; lecithin (soybean-oil lecithin) etc. is used. In addition, the higher alcohol (a butanol, octyl alcohol, myristyl alcohol, stearyl alcohol) of carbon numbers 4-40 and these sulfates, a sulfonic acid, a phenyl sulfonic acid, an alkyl sulfonic acid, a sulfonate, phosphoric acid monoester, a phosphodiester, phosphoric acid triester, alkyl phosphonic acid, phenylphosphonic acid, an amine compound, etc. are usable. Moreover, a polyethylene glycol, polyethylene oxide, sulfo succinic acid, a sulfo succinic acid metal salt, sulfo succinate, etc. are usable. These dispersants are usually used by one or more kinds, and one kind of dispersant is added in the range of 0.005 - 20 weight section to the binder 100 weight section. The operation of these dispersants may be made to put on the front face of an abrasive material or non-grinding impalpable powder beforehand, and is in the middle of distributed, and may be added. Such a thing is shown in JP,39-28369,B, JP,44-17945,B, JP,44-18221,B, JP,48-7441,B, JP,48-15001,B, JP,48-15002,B, JP,48-16363,B, JP,49-39402,B, a U.S. Pat. No. 3387993 number, said 3470021 numbers, etc.

[0042] as the antifungal agent used for this invention — a 2-(4-thiazolyl)-benzimidazole N-(fluoro dichloro methylthio)-phthalimide, 10 and the 10'-oxy-screw FENOKI sarcine, 2, 4, 5 and 6 tetra-chloro isophthalonitrile, P-tolyl diiodomethyl sulfone, triiodo allyl alcohol, a dihydroaceto acid, phenyl oleic acid mercury, an oxidization screw (tributyl tin), and a SARUCHIRUA scallion -- there is id etc. such a thing — for example

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[Translation done.]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] A deer is carried out and it is difficult with above optical connecter ferrules or polish objects for magnetic-head polish to grind the dissimilar-material front face of a semi-conductor flat and smooth, without producing a level difference.
[0007] That is, many dissimilar materials, such as aluminum, silicon, photoresist resin, a tungsten, copper, and gold, are contained, and in order to produce a multilayer substrate, it is necessary to grind these to homogeneity and to acquire a smooth side to a semi-conductor substrate.
[0008] Then, this invention uses as an offer plug the polish object which enabled it to grind the semi-conductor substrate front face which is made in view of the point describing above, improves the polish property in polish objects which come to prepare the polish layer which consists of abrasive material impalpable powder and a binder on a flexible base material, such as a polish tape and a polish sheet, and consists of many dissimilar materials uniformly and flat and smooth.

[Translation done.]

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MEANS

[Means for Solving the Problem] The polish object of this invention which solved the above-mentioned technical problem comes to prepare the polish layer which consists of abrasive material impalpable powder and a binder on a flexible base material, and said abrasive material particle is characterized by average grain size containing the binder in which said binder has the functional group which catches a metal ion, including the fine particles which are 40-1000nm 60% or more with Mohs hardness 6-7.
[0010] In addition, the thing of a silica (Mohs hardness 7), a zirconia (Mohs hardness 7), titanium oxide (Mohs hardness 6-7), cerium oxide (Mohs hardness 7), red ocher (Mohs hardness 6), and the garnets (Mohs hardness 7) which contains a kind at least is suitable for said abrasive material impalpable powder. Moreover, it is desirable to set center line average surface roughness Ra of said polish layer front face to 1-5000nm.
[0011] It is desirable that the amount of metal ion contamination from the polish object when grinding a metal prepares on the other hand so that Na, K, and Cr may be set to 150 or less ppb.

[0012] In addition, as a functional group which catches the metal ion in said binder, an acid functional group or a functional group with a chelate effect is suitable.

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EXAMPLE

[Example] Below, below the example and the example of a comparison of this invention are shown, and the property is evaluated. In addition, the "section" in an example shows the "weight section."
[0054] The under coat was prepared on the base material by polyethylene terephthalate with a <examples 1-5> thickness of 125 micrometers, on it, kneading distribution was carried out, viscosity control of the following presentation A was carried out to homogeneity, the coating liquid for polish layers which mixed the curing agent was applied and dried, the polish layer was prepared, it started in predetermined magnitude, and the sample of a polish object was produced.

[0055] As shown in the following table 1, an abrasive material is a silica (average grain size: 0.1 micrometers), the amounts (Yx10 - 4Eq/(g)) of the functional group (sulfonic group) of a binder differ, an example 5 is titanium oxide (average grain size: 0.1 micrometers), and the abrasive material of a functional group is [each examples 1-4] the same as that of an example 1. In addition, the functional group of the above-mentioned binder is a functional group (SO3H) with the free whole quantity.
[0056] While grinding aluminum and a silica to coincidence and measuring the level difference of a polished surface with the polish object of the above-mentioned example, the result of having ground the silicon front face and having measured the metal ion concentration on the front face of silicon after polish is shown in the following table 1.
[0057] In the <examples 1-4 of comparison> table 1, the result of having performed the same polish test with the polish object of the examples 1-4 of a comparison is written together. It is the example of the binder which does not contain the functional group which catches a metal ion to said examples 1-4, and the examples 2 and 3 of a comparison are examples of an abrasive material with as high Mohs hardness as 8 or 9, the examples 4 of a comparison are 5 and an example of a low abrasive material, and the Mohs hardness of the binder of the examples 2-4 of a comparison is [the example 1 of a comparison] the same as that of an example 1.
[0058] From the result of Table 1, the level difference in coincidence polish of a dissimilar material can perform 3-5nm and polish it is small and smooth and good with the polish object by this invention examples 1-5, and the result also with the metal ion concentration good at a value with small 80 - 100ppb and amount of contamination on the front face of silicon after polish is obtained. On the other hand, in the example 1 of a comparison, by the functional group which catches a metal ion not being included in a binder, although a level difference is small, the amount of metal ion contamination on the front face of silicon serves as a big value. Moreover, in the examples 2 and 3 of a comparison with the high Morse altitude of an abrasive material, a level difference serves as a big value and the amount of metal ion contamination on the front face of silicon both also serves as a big value from which smooth nature is not obtained. Furthermore, in the example 4 of a comparison with the low Morse altitude of an abrasive material, although a level difference is a small value, the amount of metal ion contamination on the front face of silicon serves as a big value.
[0059]
[— coating liquid presentation for polish layers: — A]

An abrasive material (quality of the material: X, average grain size of 0.1 micrometers) 100 section binder (polyester polyurethane:) [neopentyl glycol] A /caprolactone / phthalic acid / diphenylmethane Diisocyanate =3/2.1/4.7/1.0 mol, SO3H 100-% of the weight content, content Yx10-4 eq/g The ten sections Binder (isocyanate) The two sections Dispersant (sulfo succinate) The 0.1 sections Diluent (methyl ethyl ketone) The 150 sections [0060]

[Table 1]

	研　磨　剤		ﾊﾞｲﾝﾀﾞｰ官能基量	段　差	金属ｲｵﾝ濃度
	材質Ｘ	モース硬度	Ｙ×10^{-4}eq/g	ｎｍ	ｐｐｂ
実施例１	シリカ	7	１０	5	１００
実施例２	シリカ	7	4	5	１００
実施例３	シリカ	7	1	5	９０
実施例４	シリカ	7	0.1	5	１００
実施例５	酸化チタン	6	0.1	3	８０
比較例１	シリカ	7	なし	5	２５００
比較例２	酸化クロム	8	１０	４５	７００
比較例３	アルミナ	9	１０	５０	１２００
比較例４	γFe_2O_3	5	１０	0	５０００

[0061] A ground object is rotated by 100rpm and the polish conditions in Table 1 are a polish object feed rate 100 mm/min Carrying out, polish time amount is for 30 seconds. After a level difference measurement trial grinds the measuring plane of aluminum and a silica evenly first, it doubles this flat side horizontally, grinds it on the above-mentioned conditions to coincidence, and measures the polished surface level difference of the aluminum and the silica after polish. Moreover, measurement of metal ion concentration grinds a silicon front face for 30 seconds on the above-mentioned conditions, and measures the metal ion concentration on this front face of silicon.

[Translation done.]